

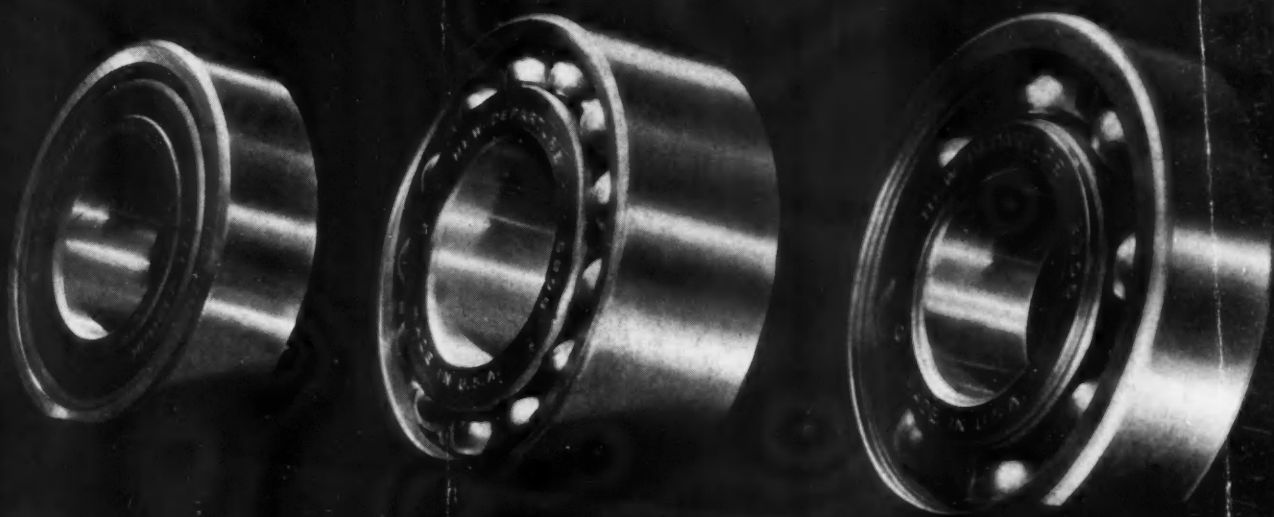
DEC 1 1941

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

DECEMBER 1, 1941

Dedicated to the service of making American-built equipment
of every kind work faster, produce better, last longer.



New Departure
THE FORGED STEEL BEARING

MACHINES SPEEDED UP 14%

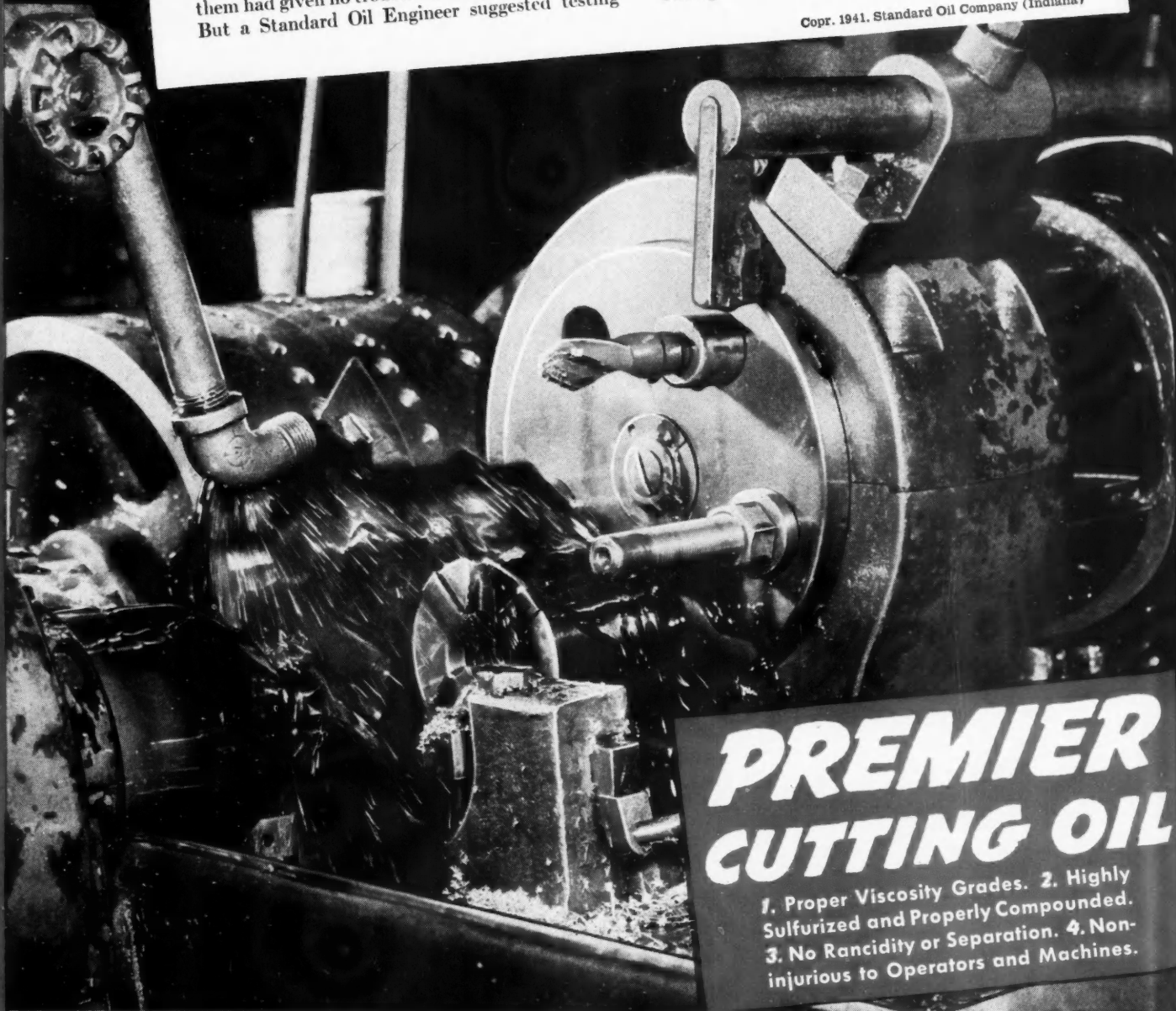
● CAN YOU think of a faster, easier and cheaper way to increase machine tool production than by the use of a more efficient cutting oil? You can still attempt to get new machines and new tools, but you can have better tool life, fewer tool changes and higher production *right now*, on your present machines, if you get the right cutting oil.

Here's an example. A manufacturer of compressors, air hoists, etc., had a number of automatic machines in his shop. The cutting oil used on them had given no trouble for the past three years. But a Standard Oil Engineer suggested testing

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Let a Standard Oil Engineer help you test the cutting oil or coolant he recommends for any job you name. Write the local Standard Oil Company (Indiana) office or 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

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AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Reg. U. S. Pat. Off.
Published Semi-Monthly

Volume 85

Number 11

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Cable Address.....Autoland, Philadelphia

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903, the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1915.

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices

Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

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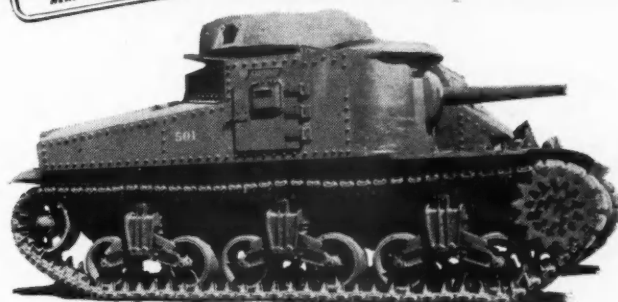
December 1, 1941

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AUTOMOTIVE INDUSTRIES, Vol. 85, No. 11, Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In Case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign \$2.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 1, 1942), 50 cents.

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NATIONAL DEFENSE



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Vital to the performance of these huge land battleships are YOUNG oil coolers. Especially designed by YOUNG engineers for the M-3 tank, YOUNG units cool both the lubricating oil in the 400-hp. Wright radial airplane engine and oil in the tank's 7600 lb. transmission. YOUNG's patented tube and fin construction with seamless joints is taking all the punishment these bouncing, battering monsters can give. This is just one example of YOUNG's ability to solve difficult cooling problems. Cooled-by-Young has come to mean ample cooling capacity together with durability and trouble-free performance.

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DIESEL ENGINE COOLING RADIATORS
+ INTERCOOLERS + HEAT EXCHANGERS
+ ENGINE JACKET WATER COOLERS

Increase Tool-Life

30 To
40%



EXAMPLES of the quality work done on one of the B. & S. Automatics at Whitney Metal Tool Co., Rockford, Ill. Whitney uses *Texaco Cutting Coolants* 100%.



TURNING, boring, threading high-grade alloy tool steel, the Whitney Metal Tool Co., Rockford, Ill., secured a 30-40% increase in tool life with no change in feeds or speeds . . . as one result of using *Texaco Transultex Cutting Oil B*.

Transultex cools both cutter and work, thus preventing chip welding and assuring finer finish and increased life for cutters.

With Transultex the operator *sees* what he is doing, avoids jamming cutter and work.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred also in the metal cutting field.

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TEXACO Cutting and Soluble Oils

FOR THE METAL-WORKING INDUSTRY

RETURN METAL DRUMS PROMPTLY . . . thus helping to make present supply meet industry's needs and releasing metal for National Defense.

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 85 December 1, 1941 Number 11

Base Periods for Parts Production Schedules

Designed to aid manufacturers of batteries and other parts makers whose chief production occurs during the last half of the year, OPM Priorities Director Donald M. Nelson on Nov. 21 issued an amendment to order L-4, covering the production of replacement parts for passenger cars and light trucks, permitting selection of either Jan. 1-June 30 or July 1-Dec. 31 as the base period on which to figure total production from Sept. 15 to the end of the year.

This alternative base period, OPM said, will result in greater fairness to producers whose peak output comes in the last half of the year. An A-10 preference rating was assigned to deliveries of materials for the manufacture of replacement parts listed in the limitation order.

The original limitation order provided that the spare parts producer may make during the Sept. 15-Dec. 31, 1941, period, 60 per cent of the number of parts sold by him for replacement purposes during the Jan. 1-June 30, 1941, period.

Reports reaching the OPM Automotive, Transportation and Farm Equipment Branch of the Division of Civilian Supply showed that many producers have their heaviest output in the months from July to December.



December 1, 1941

Parts Manufacturers Pool Production Equipment 19

A group of twenty-five companies, twenty-four of them automotive, are cooperating in bidding on defense contracts. This organization will have an opportunity to bid on contracts that would take a wider range of equipment than any one of them possesses. Through the curtailment of automobile production and priorities any single one of these companies would be faced with an impairment of their financial positions and unemployment of their workers were it not for this cooperative action.

Continental Completely Renovizes Plant 20

To do the right kind of a job in the quickest possible time for our Uncle Sam, in the manufacture of military engines the Continental Engine Corp. has returned to its former Detroit plant with its defense work and has done a most complete job of making things just right. Read how it was done and what it will accomplish.

1942 Gear Shift Developments 32

During recent months innovations have been presented in new types of gear shifts. As the 1942 models came to the front there appeared a number more, each with its own special features of design. In this article, drawings and text have been used to cover the whole ground as they have been made available in the new models.

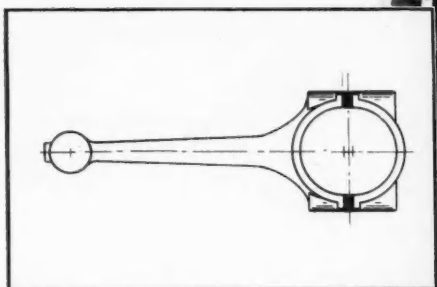
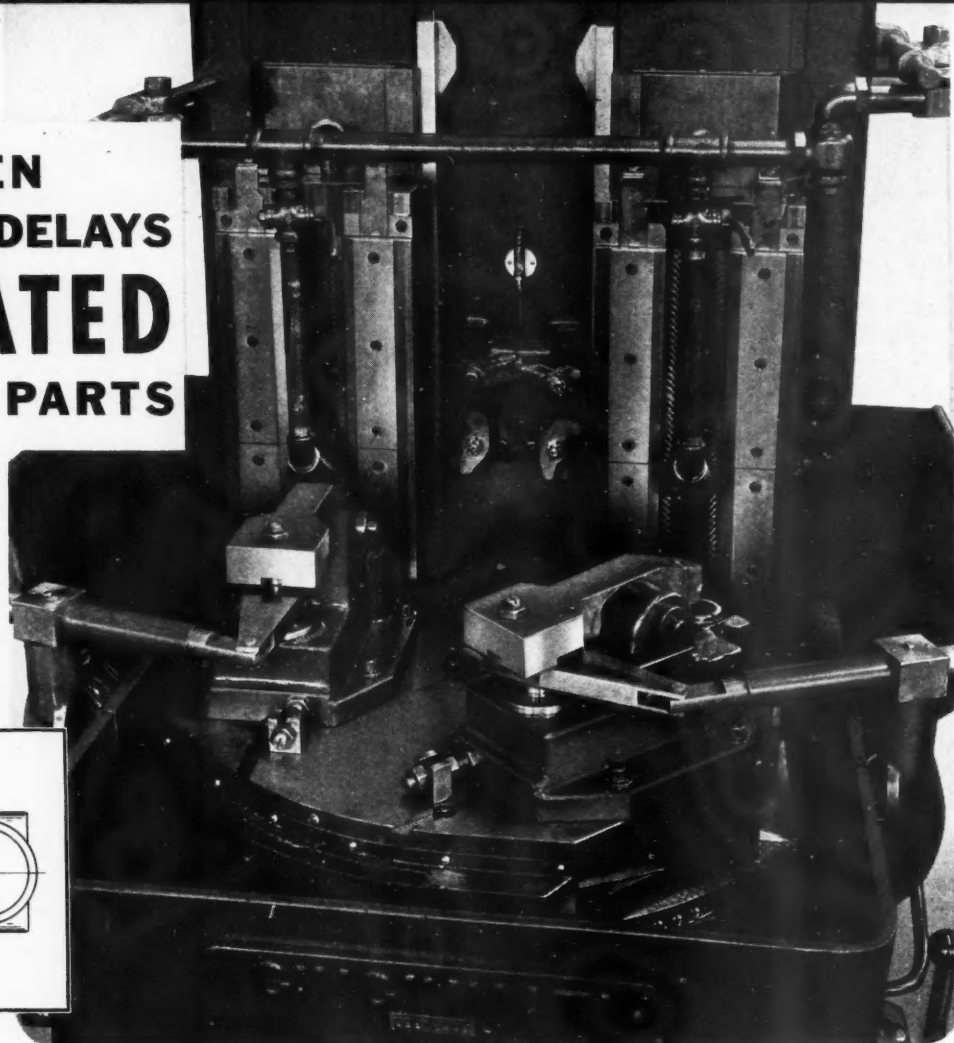
Optically Flat Surfaces in Mass Production 46

An extensive study has been made by the Mid-West Abrasive Co. that has brought out some real results in practical application to the mass production methods of the automobile and defense programs.

Creeper Track for Single Wheels 47

A unique design for equipping vehicles with two or four driving wheels with a self-laying type of track mechanism. It is applicable to all existing trucks and tractors.

NINETEEN PRODUCTION DELAYS ELIMINATED EVERY 6000 PARTS

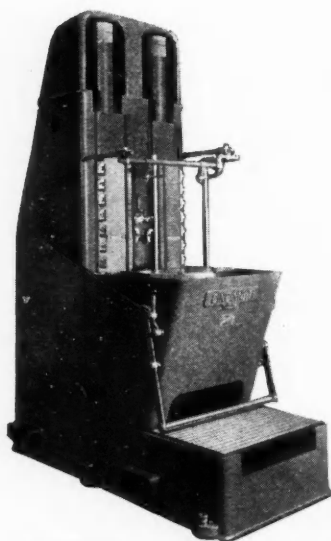


IN many types of machining operations, frequent changing of dull cutters is one of the major items of production delay. Sawing apart caps and connecting rods may be listed as typical. The saws dull quickly; require frequent changing, resharpening, and resetting; increase the possibility of work spoilage. In one large automotive plant, these undesirable factors were reduced to a minimum by the unconventional but very successful method of sawing caps from rods with the CINCINNATI broaching equipment illustrated above.

The number of pieces per grind increased more than 20 times—300 by sawing; over 6000 by broach-sawing.

The machine is a CINCINNATI No. 5-42 Duplex Vertical Hydro-Broach, equipped with automatic clamping fixtures. All the operator has to do is load and unload the work, and nineteen of his former production delays are eliminated every 6000 parts.

Perhaps CINCINNATI Broaching Machines, with their automatic features, combined with their quick broach-holder changing feature, can help your production problems while reducing costs and floor space requirements. Our engineers will be glad to give you their recommendations.



● CINCINNATI Duplex Vertical Hydro-Broach Machine. No. 5-42 size illustrated above; six other sizes listed in catalog M-894. Write for your copy today.



THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... DIE SINKING MACHINES

Parts Manufacturers Pool Production Equipment

***Group 1, Composed of 25 Key Companies, Formed
at Detroit to Bid on National Defense Contracts***

ALTHOUGH the automotive industry has received more than four billion dollars in national defense contracts, there are many parts and accessory companies supplying the industry that have not participated in these huge Government awards. These companies will be seriously affected by the progressively deeper cuts in passenger car production unless they receive defense work to help compensate for this loss of normal business. Unemployment and impairment of some companies' financial condition will result. Especially hard hit will be the metal stamping, plating and automotive fiber manufacturers.

In order to alleviate this impending dislocation in the automotive parts industry, number of companies centered in Detroit have formed the Metal Working Manufacturers Committee, Group No. 1, to co-ordinate defense bidding and pool production facilities. This group has set up headquarters in Detroit and hired a permanent secretary to direct administrative work.

Twenty-five key companies, most of them in the Detroit area and all but one in the automotive parts industry, comprise this group. The lone exception is a manufacturer of residential hot water heaters. Following the lead of the washing machine manufacturing industry, this group is making a survey of manufacturing facilities with a view to making bids on primary defense contracts and also some large-scale subcontracting on defense orders to the automobile industry.

In order that bids might be placed on a wider range of defense items, this initial group of 25 companies was selected for the maximum versatility of their equipment. A selective job of inspecting the equipment schedules of more than 50 companies was conducted with this in view. This plan will enable the pool to bid on contracts requiring metal stamping, machining, forging and welding facilities, whereas a single manufacturer would have trouble landing defense jobs, especially with only metal stamping presses available. The original group of 25 companies offers this diversity of equipment rather than a great dupli-

cation of machines. Other automotive parts companies ranging in location from Kansas City to Boston, have submitted their equipment schedules to the committee and hope to gain information that will lead to defense subcontracts.

The members of the pool range from large plants employing several thousand employees, such as Motor Products Corp. and the L. A. Young Spring & Wire Co., to the Davis Tool and Engineering Co., which has about 30 men on its payroll. At the head of the group is the three-man Managing Committee, composed of Alan T. McHenry, president of Bowen Products Co., Ecorse, Mich., as chairman; Ralph E. Fisher, of the Eaton Mfg. Co. Stamping Division, and Charles J. Soss, president of Soss Mfg. Co.

Carrying on the engineering work is a six-man committee composed of production men who study equipment schedules and Government specifications to ascertain whether the group is prepared to bid on various items. This committee includes George P. Nelson, L. A. Young Spring & Wire Co., as chairman; W. N. Davis, Davis Tool & Engineering Co.; F. A. Grandy, American Stamping Co.; George T. Belfe, Detroit Gasket & Mfg. Co.; Daniel Dewey, Eaton Mfg. Co. Stamping Division, and Charles J. Soss.

The Managing Committee has had conversations in Washington with officials of the Army Ordnance Dept. and the Labor and Contract Distribution Divisions of OPM. These have proved encouraging, as the Government is desirous of spreading defense work as much as possible to preserve the structure of the national economy. The Metal Working Manufacturers Committee is hopeful of having the automotive parts industry certified by OPM as a distressed industry, such as was the case with the washing machine manufacturers. This permits price differential in bidding on Government contracts. However, the huge amount of defense orders allocated to the automobile manufacturers and to the Detroit area may prove a handicap to such certification.

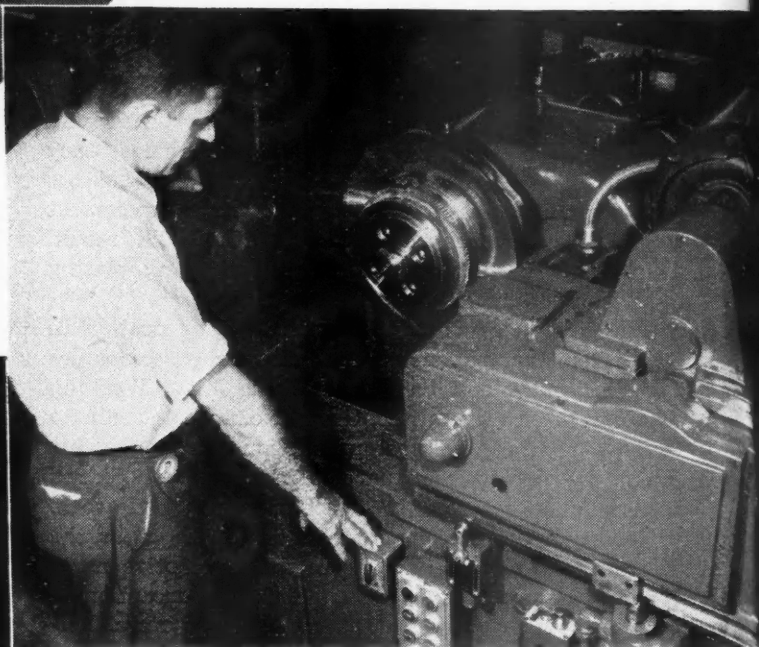
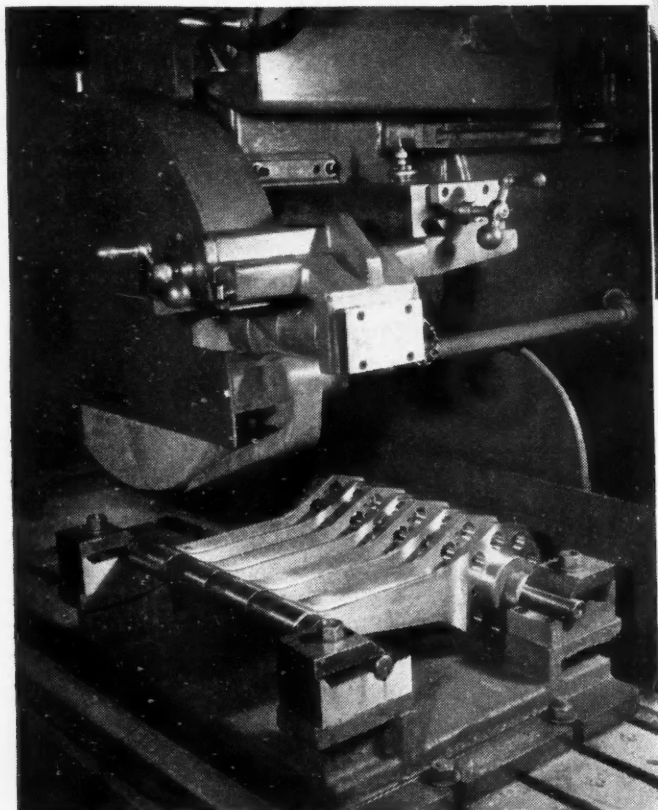
Tripling of the Government's medium tank building
(Turn to page 82, please)



Continental

(Circle) One of a number of Jones & Lamson automatic precision thread grinders in this plant. The machine shown here is threading the end of the crankshaft. Other machines are employed for the threading of cylinder barrels and other parts. It is interesting to note that these automatic thread grinders may be used either for finish-grinding milled threads or for cutting threads right from the finished outer diameter without other preparation.

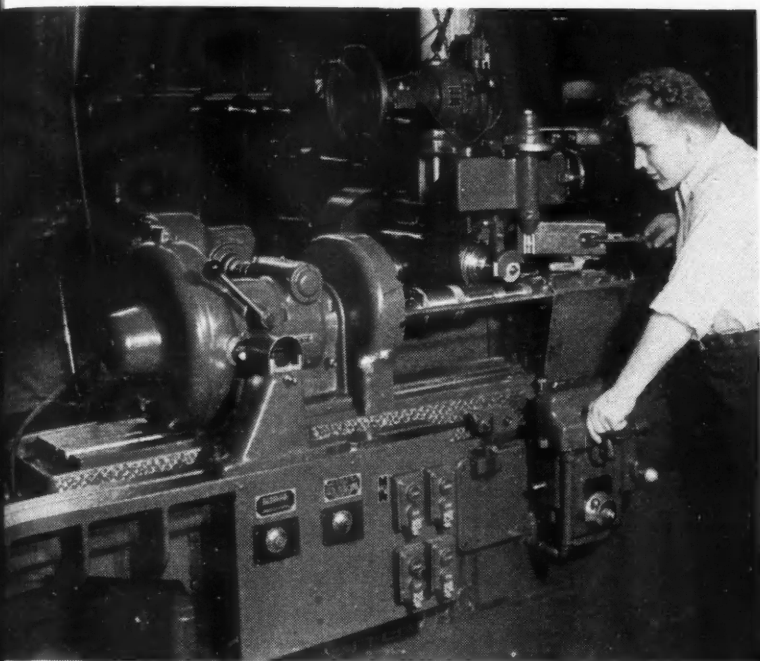
(Below) Thompson vertical grinder on the master rod line—for grinding the channel contour.



(Above) Milling profile of intake and exhaust cam rings on this unique two-head Van Norman miller. Master cams for guiding each head may be seen on the work head in the center of the machine.

SPURRED by the demands of the defense program, Continental Motors Corporation has returned to its Detroit plant, the scene of its early triumphs as one of the principal producers of engines for the automotive industry. In the process, the only familiar feature reminiscent of the original plant is the building itself, since the interior has been completely renovated and suitably altered for the manufacture of R975 nine-cylinder, radial, air-cooled aircraft engines for military tanks and

Completely Renovizes Plant for Military Engine Production



Grinding splines on the crankshaft with a Fitchburg spline grinder.

at will, making it possible to move machinery freely from one point to another as required.

Consistent with the productivity of this plant, most of the inter-departmental materials handling is taken care of by industrial trucks. Typical of this equipment is the Automatic Transportation Co., 4000-lb. center-control, tilting, tiering fork truck designed for a variety of heavy duty materials handling tasks.

Quality control is a basic consideration here as it is in every establishment concerned with the manufacture of airplane engines and accessories. Heavy forgings such as the crankshaft sections, the master rod, the link rods, the counter-weights—are turned and milled and faced and bored in a multiplicity of steps, reducing the weight of the finished part to but a fraction of the bulk of the forging. The roughing operations are followed by grinding, precision boring, precision tapping, precision

thread grinding, etc., and finally by filing and burring and polishing to exceedingly fine surface finish free of even minute surface imperfections and tool marks.

Important threaded sections are precision ground, using either J & L or Ex-Cell-O thread grinders. All gears are hobbled, generated, or shaped, generally in two distinct operations, ground after heat treatment, and in some instances lapped after grinding. Splines are ground to assure perfection of finish and dimensional accuracy.

military training ships on defense contracts.

This reminds us that a little more than two years ago, Nov. 1, 1939, to be precise, we recorded in AUTOMOTIVE INDUSTRIES the complete centralization of all Continental activities in Muskegon. The present development forms a part of the amazing picture of the expansion of the automotive industry in furthering the national defense program.

The Detroit plant may be considered as an entirely new venture. Utilizing something over 400,000 sq. ft. of floor space, the buildings are completely new inside, provided with additional glass areas for better daylight seeing. It is laid out along the lines of the most advanced mass production practice, departmentalized, and fitted with the most modern manufacturing equipment known to the art.

In addition to the manufacturing departments, described more in detail later, there is a large tool room, an excellent heat treating department provided with the latest type of metallurgical equipment, and a spacious final assembly department.

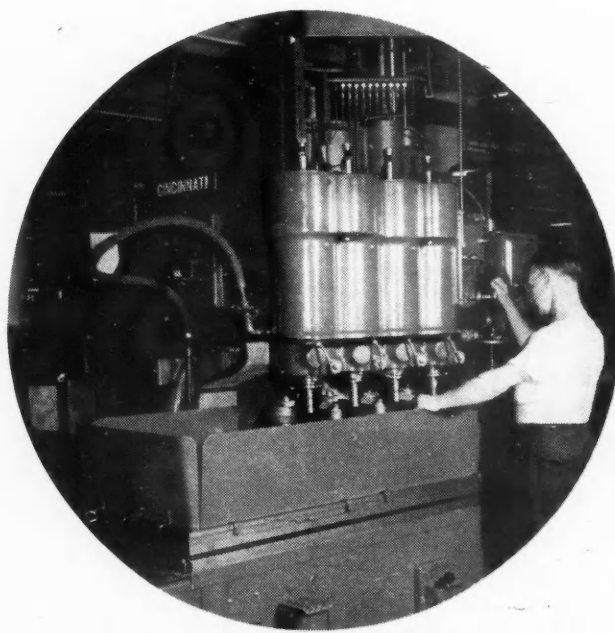
Flexibility of the machine lines throughout the plant is facilitated by the utilization of the Bulldog Bustris system of centralized power ducts which makes it possible to plug in the machines and portable tools

***This is the Sixty-fifth
in the series of monthly
production features***

Some idea of the dimensional tolerances specified by the Army may be gained from the specific examples noted elsewhere.

Needless to say, a great deal of thought has been given to the use of cemented-carbide tipped cutting tools for the machining of steel and aluminum since these special cutting tools make it possible to get the maximum productivity out of the modern machine tools, providing at the same time, a perfection of surface finish coupled with fine dimensional tolerances. According to a report from the Carboloy Company, cemented-carbide tools of suitable grades are being employed for precision boring, turning, milling, and reaming—on all aluminum parts and on many steel parts. Cemented-carbide tools will be found on engine lathes, on turret lathes, on vertical turret lathes, on Bullard Mult-Au-Matics, and on milling machines. Similarly, Vascology-Ramet Corp. reports on a number of Ramet and Tantung tools for steel and aluminum machining operations.

Ramet-tipped tools have been applied for the machining of aluminum, one job in particular being



Four-head Cincinnati Hydro-Tel automatic milling machine is used for the rough-milling of the outer contours and channel on rough master rod forgings.

Factory Routing of Cylinder Head

OPERATION AND EQUIPMENT

INSPECT

Bench

Disc **GRIND** rocker box faces

Gardner Disc grinder

FACE and **FORM** turn

No. 1-A Warner & Swasey turret lathe

CUT OFF riser

Power saw

Rough and finish face **BORE**, **FORM** and **CHAMFER** combustion chamber

Bullard Mult-Au-Matic

Air TEST

Water test stand

Target and **DRILL** locating hole in front spark

Leland-Gifford No. 3 drill press

DRILL semi-finish, **REAM**, **COUNTERBORE** and **SPOT-FACE** valve guide hole and valve seat hole (exhaust)

No. 4 Leland-Gifford drill press

DRILL semi-finish **REAM**, **COUNTERBORE** and **SPOT-FACE** valve guide and valve seat hole (intake)

No. 4 Leland-Gifford drill press

COUNTERBORE exhaust rocker box

No. 4 Leland-Gifford drill press

COUNTERBORE intake rocker box

Leland-Gifford No. 4 drill press

Finish **BORE** valve guide holes and valve seat holes (exhaust and intake)

Ex-Cell-O Diamond bore

MILL intake port

Kearney & Trecker No. 2 horizontal milling machine

MILL rocker box faces

No. 2-H Kearney & Trecker plain horizontal milling machine, 2-spindle

MILL exhaust port

No. 2 Kearney & Trecker horizontal milling machine

MILL between rocker box bosses

No. 2 Kearney & Trecker plain horizontal milling machine

MILL 2 bosses and rib (intake side)

No. 2 Kearney & Trecker vertical milling machine

MILL 1 boss (exhaust side)

No. 2 Kearney & Trecker vertical milling machine

MILL 20 deg. angle boss (intake side)

No. 2 Kearney & Trecker plain horizontal milling machine

MILL 20 deg. angle boss (exhaust boss)

No. 2 Kearney & Trecker plain horizontal milling machine

MILL lugs both ends of rocker box

No. 2H-4-spindle Kearney & Trecker special milling machine

BORE and **CHAMFER** intake port

No. 4 Leland-Gifford drill press

DRILL **REAM** and **COUNTERBORE** rocker shaft holes

Leland-Gifford special rail drill

DRILL cover holes and 3/16 hole in No. 1 fin

Barnes drill press—No. 201 1/4 Krueger head

DRILL, **REAM**, and **TAP** exhaust push rod housing hole

No. 3 Leland-Gifford Drill press

DRILL, **REAM**, and **TAP** intake push rod housing hole

Leland-Gifford No. 3 drill press

DRILL 4 holes in rocker box lugs and drill 2 holes

No. 2 Leland-Gifford drill press

DRILL 2 holes in exhaust flange

No. 2 Leland-Gifford drill press

DRILL 2 holes in rocker boxes

Special 2-spindle drill

COUNTERSINK all holes to be tapped

Bench

TAP 8 rocker box cover holes

Bausch tapper

TAP 2 exhaust flange holes

Bausch tapper

TAP 2 holes in rocker box

Bausch tapper

TAP 2 holes 20 deg. angle

Bausch tapper

WASH

Tank

BURR, **BLEND**, **SCRAPE** and break corners

Bench

CLEAN air hose

Hood

TAP threads

LeBlond lathe

FINISH hand tap

Bench

INSPECT

Bench

DRILL, **REAM**, **COUNTERBORE**, and **TAP** spark plug holes

Natco special drill press

Back **COUNTERBORE** spark plug holes

Special backspotface machine

INSPECT spark plug holes

Bench

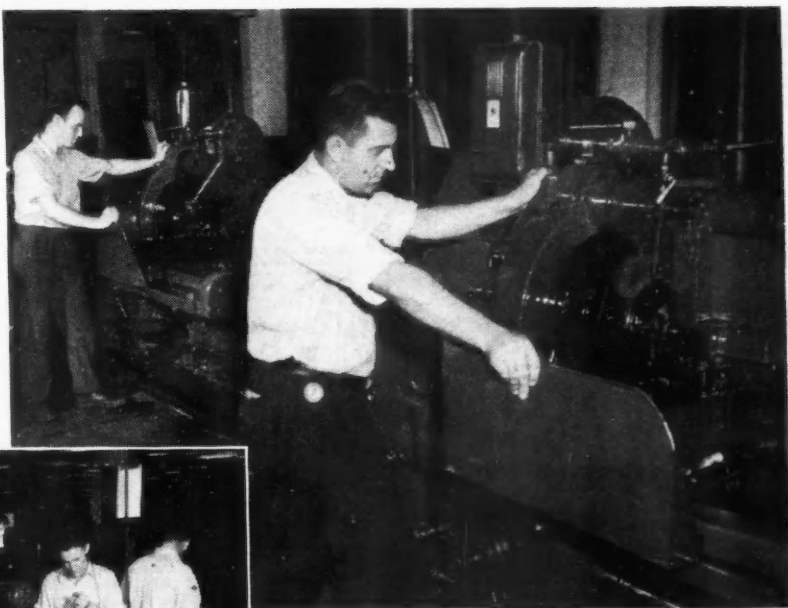
the machining of the aluminum housing on Gisholt turret lathes. This has reduced scrap losses and has provided an excellent surface finish compatible with Air Corps requirements. Another outstanding application is that of Ramet-tipped reamers for finishing valve guides. Not only do these reamers speed up the operation but they produce holes within 0.0005 in. of the specified size.

Finally, on the subject of tooling, it may be mentioned that Continental has drawn upon the facilities of Scully-Jones, well known specialists in the field of small tools for a variety of tool set-ups for boring and other operations where precise alignment of tooling and a high order of precision are paramount. Among these special tools are—drill chucks, extension sockets, drill collets, tapping chucks, boring bars, etc.

Coming to the details of the manufacturing facilities, we may note at the outset that it is, obviously quite beyond the scope of a single discussion to cover the entire operation with any degree of completeness. For this rea-

son, we have chosen samples of the activity and have selected a group of factory routings which give the complete sequence of operations on a number of typical parts. In addition, we have been fortunate in securing the details of some of the individual set-ups, thus affording an intimate close-up of important single operations.

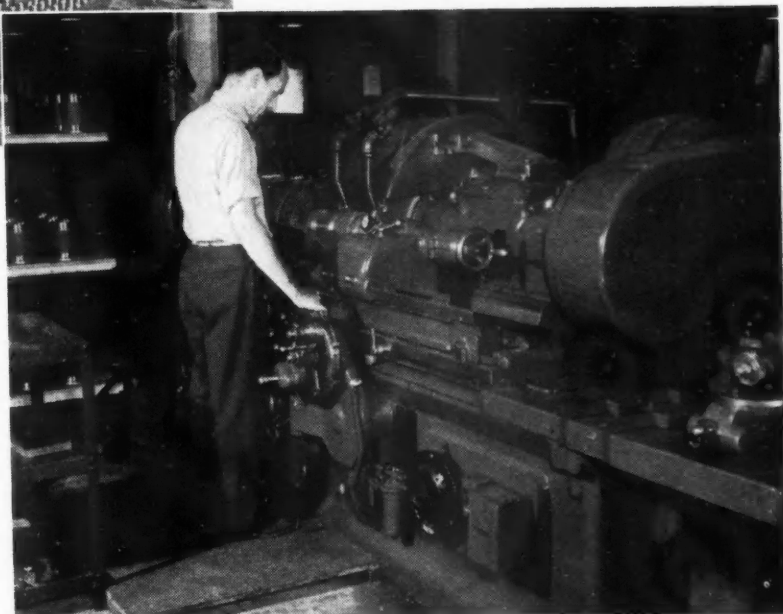
As mentioned earlier, the operations have been departmentalized so as to expedite the smooth flow of work on each major element of the engine. Among



(Above) Part of a battery of Gisholt Simplicatics in the cam department—finish-facing, turning, grooving, and counter-boring.



(Above) A group of Micromatic Hydro-honer machines in the general grinding department. These machines are used for a variety of small-hole honing operations.



(Right) Norton plain grinder finish-grinding various diameters on the cylinder barrel.

the major divisions are the following:

- crankshaft department
- cylinder head
- cylinder machining
- pistons
- connecting rods
- crankcase sections
- screw machine department
- paint department
- miscellaneous grinding
- flywheel department
- gear department
- heat treat

It may be of interest to high-spot some of the items of modern equipment found in this plant. In the first place, it is noteworthy that Continental has one of the largest installations of Gisholt Simplimatics to be found in any similar establishment. Batteries of these

machines are basic to the set-up of the major parts such as crankcase sections, connecting rods, and cam rings. Fay automatics are found on a great many operations, as may be noted on the routings. Ex-Cell-O has supplied a variety of special and intricate machines for drilling, for tapping, for precision boring, etc. In addition, the Ex-Cell-O precision thread grinders are found on various thread grinding operations. Supplementing this equipment are a number of the new Jones & Lamson precision thread grinders, one of the latter being a unique two-wheel machine which greatly expedites the finishing of threaded sections.

On the crankshaft line will be found—Fay automatic lathes, Norton grinders, K & T milling machines, Bryant internal grinders, Fitchburg spline grinders, etc. New Colonial broaching machines have been in-

Factory Routing of Crankcase—Main Section

OPERATION AND EQUIPMENT

<p>INSPECT Bench</p> <p>SNAG casting as required Bench and flexible shaft grinder</p> <p>Rough FACE and BORE rear side Gisholt Simplimatic</p> <p>Rough FACE, TURN and BORE front side Gisholt Simplimatic</p> <p>Rough MACHINE tappet guide locating pads Bullard Vertical turret lathe</p> <p>DRILL and REAM (1) hole for locating 3 ft. Carlton radial drill</p> <p>DRILL and REAM 1 hole for locating and drill, taper ream, COUNTERSINK, and tap $\frac{1}{4}$ pipe thread 3 ft. Carlton radial drill</p> <p>Rough MACHINE 9 cylinder pads and bores Ex-Cell-O boring machine</p> <p>MILL 45 deg. pad No. 2 Kearney & Trecker Plain miller</p> <p>DRILL 30 Deg. angle hole 3 ft. Carlton radial drill</p> <p>DRILL and REAM hole 3 ft. Carlton radial drill</p> <p>DRILL 2 holes in 45 deg. pad 3 ft. Carlton radial drill</p> <p>TAP 2 holes in 45 deg. pad Bausch tapper</p> <p>DRILL 2 angular oil holes in front face 3 ft. Carlton radial drill</p> <p>DRILL, SPOTFACE, CHAMFER, and tap 2 lifting holes DRILL, CHAMFER and TAP oil strainer hole. Drill, chamfer and tap hole at section F-F 3 ft. Carlton radial drill</p> <p>DRILL 1 hole in lifting boss 3 ft. Carlton radial drill</p> <p>Air TEST case Bench and tank</p> <p>ROUGH MACHINE (18) tappet guide holes Ex-Cell-O drilling machine</p> <p>DRILL 15 holes at 45 deg. min. angle 3 ft. Carlton radial drill</p> <p>DRILL 1 hole at 68 deg. angle 3 ft. Carlton radial drill</p> <p>DRILL 15 deg. hole Leland-Gifford drill</p> <p>DRILL, COUNTERSINK, taper REAM and pipe tap 7 holes and drill and ream 1 hole for locating 3 ft. Carlton radial drill</p> <p>DRILL 3 blind holes, drill (10) 5/32 holes; drill and REAM 0.317 dia. hole and drill, ream and SPOTFACE hole in hub face 3 ft. Carlton radial drill</p> <p>DRILL inside drain holes 3 ft. Carlton radial drill</p> <p>FORM flange clearance 3 ft. Carlton radial drill</p> <p>DRILL and form opening for oil drain Bench and hand grinder</p> <p>Finish FACE, BORE, TURN and groove front end Gisholt Simplimatic</p>	<p>Finish FACE and BORE rear side Gisholt Simplimatic</p> <p>SEMI-FINISH gappet guide locating pads Bullard vertical turret lathe</p> <p>MILL gear clearance No. 2-H Kearney & Trecker vertical mill</p> <p>DRILL 20 flange holes in rear side Natco multiple drill</p> <p>BROACH keyway Davis key seater</p> <p>BACKSPOTFACE 2 mounting bosses Special backspotfacing machine</p> <p>BACKSPOTFACE 18 mounting bosses Special backspotfacing machine</p> <p>Finish BORE tappet guide holes Ex-Cell-O boring machine</p> <p>Finish MACHINE cylinder pads and bores Ex-Cell-O boring machine</p> <p>DRILL, taper REAM and COUNTERSINK 54 cylinder pad holes; drill, taper ream and COUNTERBORE 18 cylinder pad holes Ex-Cell-O drilling machine</p> <p>BURR all holes Bench and hand grinder</p> <p>FORM recess in cylinder bores 3 ft. Carlton radial drill</p> <p>Taper REAM and $\frac{1}{4}$ pipe tap 1 hole 3 ft. Carlton radial drill</p> <p>TAP all holes in cylinder pads Bausch tapper</p> <p>BROACH 0.465 dia., BURR and BLEND Bench</p> <p>TAP 18 valve tappet guide holes 3 ft. Carlton radial drill</p> <p>DRILL 27 0.257 dia. holes in front face Natco drilling machine</p> <p>DRILL (3) 0.344 dia. holes in front face; COUNTERBORE 28 holes in front face 3 ft. Cincinnati radial drill</p> <p>TAP 28—0.313-18 holes Bausch precision tapper</p> <p>BURR tapped and drilled holes; remove all sharp edges and scribe cored holes Bench</p> <p>INSPECT Bench</p> <p>DRILL and REAM 1 hole No. 3 Leland-Gifford press</p> <p>WASH Niagara washer</p> <p>ANODIZE Anodizing equipment</p> <p>PRIME Paint booth and oven</p> <p>PAINT (first coat) Paint booth and oven</p> <p>FINISH PAINT Paint booth and oven</p> <p>INSPECT paint Bench</p>
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(Circle) Sundstrand Stub Lathe on the piston line—finish turning skirt and ring grooves.

(Below) Close-up of the new DeVilbiss spray booth in the paint shop for spraying cylinder assembly units. Note the installation of a comprehensive system of monorail conveyors, transporting the units in specially-designed carriers to the spray booth, to the baking oven, to inspection.



stalled for finishing the counterweights, for broaching flats on the cylinder barrel. Cincinnati Hydro-Tel milling machines are found on the master rod line. Bullard 8-spindle Mult-Au-Matics are found on the cylinder barrel; and 6-spindle Mult-Au-Matics on the cylinder head line.

The screw machine department has a variety of hand screw machines as well as a large battery of automatics. Of the latter, there are 13 of the latest model National Acme-Gridley Model RA four-spindle bar automatics. At the moment, this battery has been tooled for 64 different set-ups as follows:

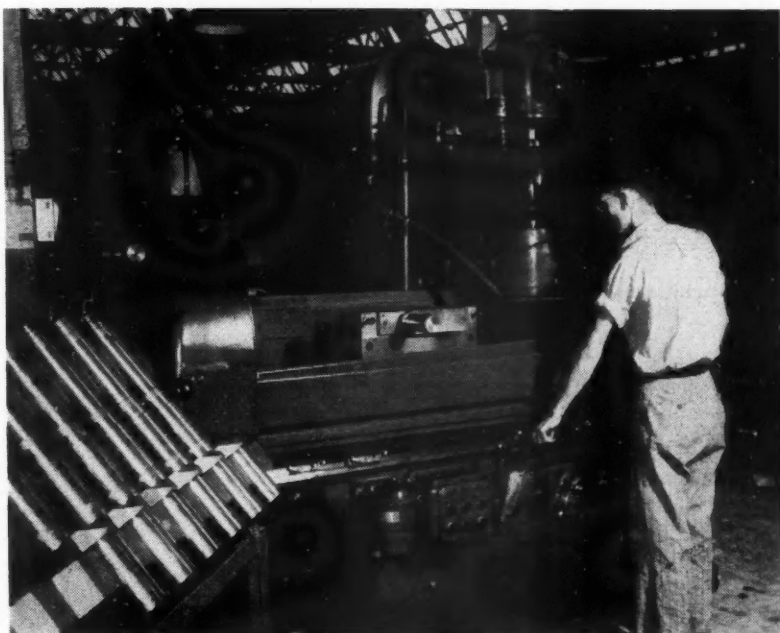
- 5—1 in. RA-4 machines on 23 set-ups
- 4—1½ in. RA-4 machines on 21 set-ups
- 2—2¼ in. RA-4 machines on 10 set-ups
- 1—3½ in. RA-4 machine on 4 set-ups
- 1—4¼ in. RA-4 machine on 6 set-ups

Perhaps one of the most interesting spots in the plant is the miscellaneous grinding department and gear department in which are grouped the many specialized machines available for these functions. Here will be found Hanchett surface grinders; Heald grinders; Norton grinders; Brown & Sharpe machines; Cincinnati Centerless grinders; two of the new Norton Hyprolap machines; a battery of six Micromatic Hydrohoners; four Ex-Cell-O thread grinders; nine Fellows Type LS gear lappers; Gleason generators of various sizes for small bevel gears and larger

accessory gears; Gear Grinding Machine Co., and Pratt & Whitney gear grinders for grinding all gears, etc.

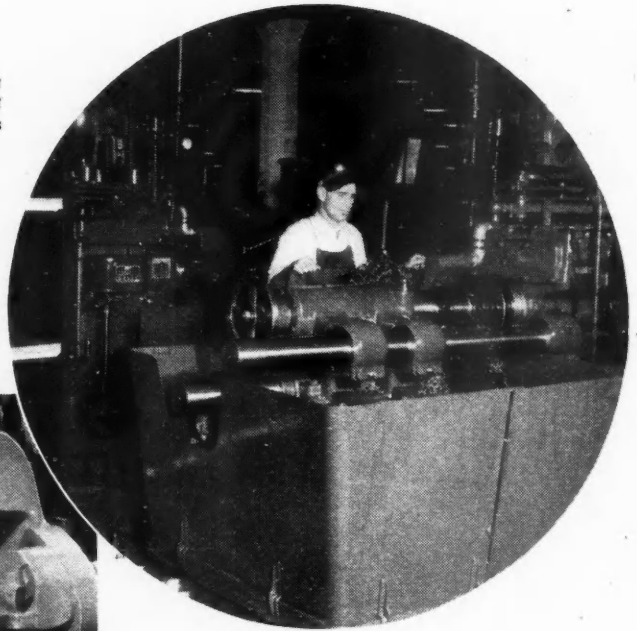
These facilities are supplemented by gear checking and testing machines including a Fellows involute measuring machine, three Fellows Red Liner testers, and a J & L comparator.

Included in this department is a large battery of Fellows gear shapers—for cutting a large variety of gears, internal and external splines of varying pressure angles, and some straight sided splines. In all, there are about 36 Fellows gear shapers of different sizes and types in the gear department and in other departments of the plant. An interesting machine of this group is the No. 7125A Indexing Gear Shaper

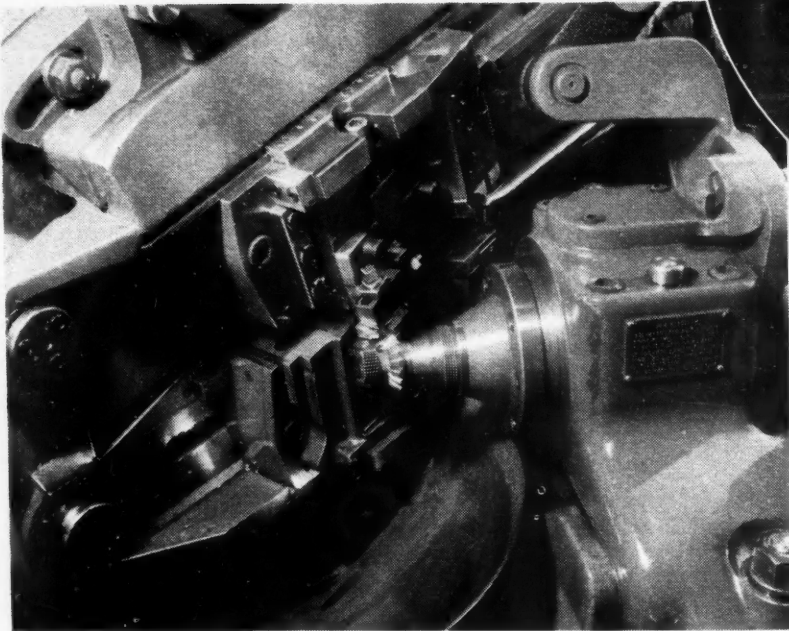


View of the Pratt & Whitney 14-inch surface grinder.

(Circle) Here is the finning operation on a Fay automatic lathe. This group is but part of the battery of Fay automatics in this plant.



(Below) Close-up of one of the small Gleason gear generators, in the gear department, used for cutting small bevel gears for accessory drives.



designed primarily for cutting straight sided internal slots. These slots have a blind end and, consequently, cannot be generated or broached. In operation, the cutter fits in to depth, backs away and automatically indexes until the cycle is completed.

The essential steps in the production of the intricately machined intake and exhaust cam rings are given in detail in the routings. The Fellows No. 61A gear shaper is used for cutting the 120 teeth of 12/14 pitch, holding the pitch diameter to plus or minus 0.001 in. of the required size, gear teeth being finished in two cuts. After heat treating, the teeth are lapped.

The profile of exhaust and intake

cams is milled on a Van Norman No. 10-CT contour miller fitted with tandem heads. Both heads come in simultaneously to the proper depth, at which point the work spindle begins rotation, the operation of the spindles being controlled by large master cams. The work is clamped hydraulically by means of a plate and C-washer, located by a large bore, the radial location being made from an internal tooth. The entire milling cycle is fully automatic.

Landis hydraulic cam grinders are used for grinding the cam profile, for rough grinding the sides of the cams, for grinding the bottom diameter, radius and side of the cam gear, etc. These machines are standard Landis cam grinders with modifications required for the specific design of the Continental parts. For grinding between the cams, the swinging cradle of the machine is locked in its forward position so that the master cam is out

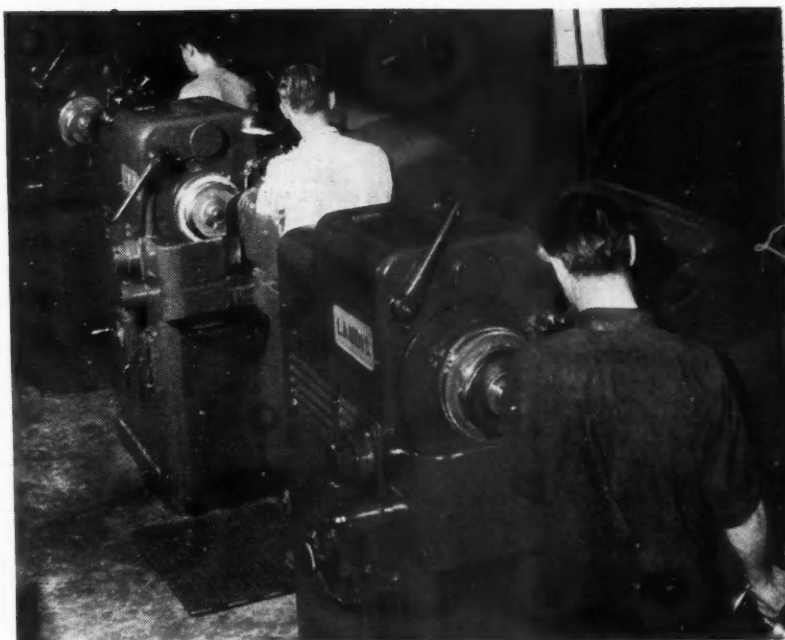
View in the cylinder head department. In the rear is a Kearney & Trecker Model 2-H vertical milling machine with two inclined heads for cylinder head bosses. In the foreground is a single-end, two-spindle Ex-Cell-O precision boring machine for finish-boring intake and exhaust valve guide holes and valve seat holes.



Battery of new Landis hydraulic cam grinders for rough and finish grinding cam profiles, sides of cams, etc.

of contact with the roller. Moreover, a much narrower wheel is employed than when grinding the cam contours. The wheel is fed straight in along the side of the exhaust cams, then straight along the side of the intake cams, then across the bottom of the throat between the cams.

The cylinder barrel is produced in several stages—machining of the barrel, then final operations during the course of the cylinder machining and studding assembly. First operation is on an 8-spindle Bullard Mult-Au-Matic—semi-finish boring, turning the skirt and flange, facing the flange and flange end. This is followed by two operations on 20-in. Fay automatics, including the finish-turning of 26 fins, rough forming the undercut on the threaded end and rough-forming a radius at



the end of the taper. After these preparatory machining operations, the barrel is hardened, degreased, drawn to 32-36 Rockwell. The part then is sand blasted,

Factory Routing of Master Connecting Rod

OPERATION AND EQUIPMENT

INSPECT

Bench

FACE, DRILL, BORE, REAM and TURN

Gisholt Simplimatic

Rough **FACE** flange, **TURN** diameter, and rough face hub

Gisholt Simplimatic

DRILL and **REAM** hole through wrist pin hub

No. 262 Barnes box column drill press

Rough **MILL** sides of channel

Cincinnati Hydromatic mill

Rough **MILL** outer

Cincinnati Hydrotel 4-spindle mill

Rough **MILL** channel

Cincinnati Hydrotel 4-spindle mill

BURR

Bench

HEAT TREAT

Leeds & Northrup furnace

DRAW

Homo furnace

SAND BLAST

Sand blast

POLISH spot

Polishing jack

INSPECT

Bench

FINISH faces, finish turn, finish **BORE & TURN** (long hub side)

Gisholt Simplimatic

FINISH faces, finish turn, finish **BORE** and **TURN** (short hub side)

Gisholt Simplimatic

Rough **DRILL** wrist pin hole and finish **REAM**

No. 262 Barnes box column drill press

Finish **MILL** side of channel (long hub up)

Cincinnati Hydromatic miller

Finish **MILL** side of channel (short hub up)

Cincinnati Hydromatic miller

Finish **MILL** wrist pin hub, edges of channel and edges of 2 cheeks

Cincinnati 4-spindle Hydrotel mill

Finish **MILL** channel

Cincinnati Hydrotel mill

GRIND hub face and grind crankpin hole

Bryant internal grinder

GRIND hub face

Heald No. 25 rotary grinder

GRIND flange and hub diameter

No. 25 Heald rotary grinder

GRIND flange and hub diameter

Heald Grinder No. 25

DRILL and **REAM** knuckle pin holes

No. 4 Natco drill press

DRILL 1 lightening hole

No. 2 Leland-Gifford drill press

DRILL, **COUNTERSINK**, and **TAP** 8 holes

No. 2 Leland-Gifford drill press

DRILL and **REAM** angle holes

No. 2 Leland-Gifford drill press (2-spindle)

DRILL and **COUNTERBORE** hole through long hub

No. 2 Leland-Gifford drill press (2-spindle)

BURR

Bench

GRIND channel

Thompson vertical spindle surface grinder

CIRCLE grind channel hub

Thompson vertical spindle surface grinder

GRIND wrist pin hole

Bryant grinder

GRIND knuckle pin holes

Bryant grinder

COUNTERSINK 1.355 diameter hole

No. 2 Leland-Gifford drill press

MILL radius at pin boss for weight

No. 3 Kearney & Trecker mill (vertical)

POLISH and **BLEND** surfaces with radii

Polishing jack

Finish **MILL** sides of 5 cheeks for weight

No. 3 Kearney & Trecker vertical mill

WASH

Tank

POLISH for weight

Polishing jack

BURR

Bench and Dental machine

Finish **GRIND** crankpin hole

Bryant internal grinder

WASH

Tank

Magnaflux **TEST**

Tank

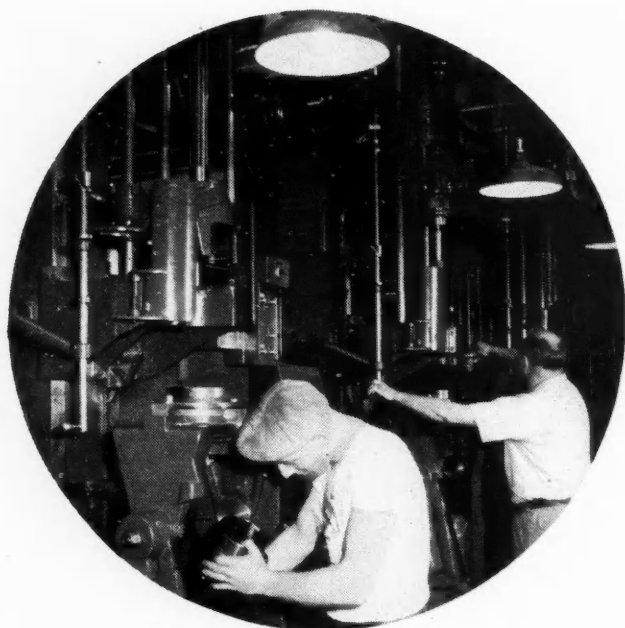
WASH

Tank

INSPECT

Bench

Factory



Barnes Drill Co., hydraulic honing machines fitted with Micromatic hones are found in the cylinder barrel department for the final honing of the barrels. Note particularly the special work-holding fixture of trunnion type to facilitate loading of barrels and to permit of inspection during the operation.

rough ground on the I.D. on a Bryant internal grinder, finish-turned on a Fay automatic, thread and skirt diameter ground on a Norton tandem grinder, followed by grinding on Norton plain grinder.

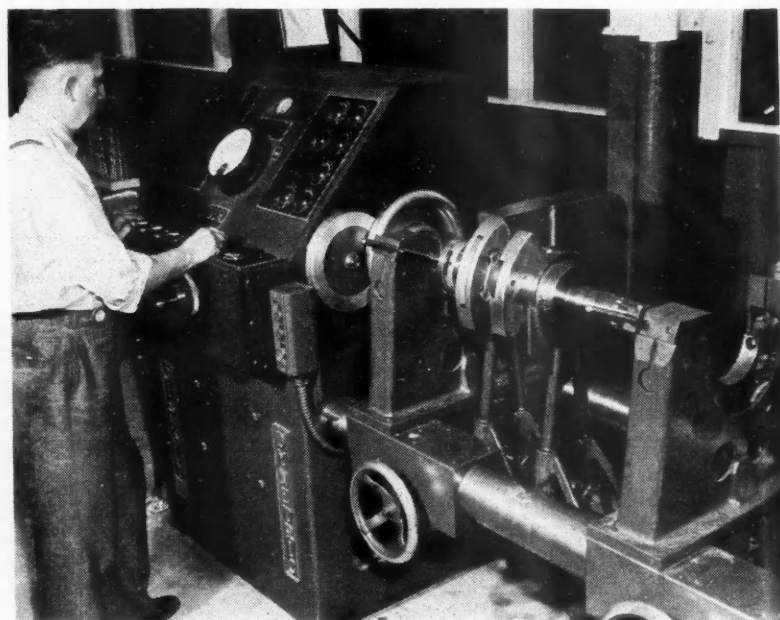
The threads are ground on either a J & L or Ex-Cell-O, producing a 12-pitch modified Buttress thread form.

Final operations are made on the cylinder studing assembly line. First operation is the heating of the cylinder heads in a furnace at 600 deg. Fahr. for 1 hr. Various fittings, including intake and exhaust seats are driven in, or attached, then the barrel is screwed in place. Then follow a series of drilling and reaming operations to rectify the previously machined parts for precise alignment as an assembly. One of the major metal cutting operations at this stage is the surface broaching of four flats on the flange, using a special Colonial broaching machine for the purpose.

Final machining operations are concerned with the finishing of the cylinder bore. This is rough and finish-ground on a Bryant internal grinder, then honed in two separate operations on Barnes No. 306-H honing machines fitted with Micromatic hones. The honed bore is held to 5.000 in. plus or minus 0.001 in. without high spots and straight; and is held for roundness to 0.002 in. for the entire length of the bore.

The surface broaching of four flats on the flange, using a type VBS, 10-42 Colonial Senior Press broaching machine is an outstanding development and worthy of special attention. The ram is equipped with an attachment having two drawing bars, the broaches being fitted with three sets of cutting teeth on each side. A series of three cuts

INSPECT forging
Bench
CUT-OFF excess end (prop. end)
Power saw
MILL to length (prop. end)
No. 3-H Kearney & Trecker horizontal mill
MILL 1½" witness slot (check face pin end)
No. 3-H Kearney & Trecker horizontal mill
RE-CENTER both ends
Sundstrand centering machine
Rough TURN shaft
20 in. x 25 in. Fay automatic lathe
FINISH TURN shaft
20 in. x 25 in. Fay automatic lathe
Rough GRIND 2 diameters shaft
16 x 36 Norton cylindrical grinder
LAY OUT centerlines—cheek and pin
Bench
MILL face of cheek
No. 3-H Kearney & Trecker horizontal mill
INSPECT
Bench
MILL cheek edges
No. 3-H Kearney & Trecker vertical mill
DRILL and **REAM** alignment hole
No. 2 Leland-Gifford drill
GRIND cheek edges
14 in. Pratt & Whitney surface grinder
ROUGH TURN crankpin
20 x 25 in. Fay automatic lathe
ROUGH GRIND crank pin
20 in. x 72 in. Norton pin grinder
DRILL, REAM and **FORM** drill (pin hole)
Radial drill press
INSPECT
Bench
MILL 20 deg. angle (both sides)
No. 2-H Kearney & Trecker vertical mill
MILL 1-19-32 radius
No. 3-H Kearney & Trecker horizontal mill
MILL 41 deg. angle on throw
No. 2-H Kearney & Trecker horizontal mill
DRILL, BORE, REAM shaft hole (pin end)
No. 3-A Warner & Swasey turret lathe
DRILL, FORM and **CENTER** (prop. end)
Radial drill press
FINISH TURN crankpin
20 in. x 25 in. Fay automatic lathe
INSPECT
Bench



Gisholt Dynetric dynamic balancing machine is used for check-balance of the complete crankshaft assembly — including counterweights. Note the large size and ruggedness of this machine.

Routing of Crankcase Front End

ROUGH MILL slot (one side)
No. 3-H Kearney & Trecker horizontal mill

ROUGH MILL slot (opposite side)
No. 3-H Kearney & Trecker horizontal mill

ROUGH MILL web
No. 3-H Kearney & Trecker horizontal mill

FINISH MILL slot
No. 3-H Kearney & Trecker horizontal mill

FILE and **CLEAN** slot (assemble spacer)
Bench

Finish **GRIND** cheek edges
14 in. Pratt & Whitney surface grinder

MILL CHAMFER both edges (one side)
No. 2-H Kearney & Trecker horizontal mill

MILL CHAMFER both edges (opposite side)
No. 2-H Kearney & Trecker horizontal mill

GRIND cheek face (shaft side)
16 x 36 in. Norton plain grinder

GRIND cheek face (pin side)
20 x 72 in. Norton pin grinder

INSPECT
Bench

GRIND shaft hole and **RE-CENTER** (pin end)
15 x 22 Bryant internal grinder

RE-CENTER—prop end
LeBlond engine lathe

SEMI-FINISH grind shaft
16 x 36 in. Norton plain grinder

SEMI-FINISH grind pin
20 x 72 in. Norton pin grinder

Form **DRILL** crankpin end
3 ft. Carlton radial drill

DRILL 17/32 radius on pin
3 ft. Carlton radial drill

INSPECT
Bench

DRILL and **REAM** 30 deg. angle
No. 2 Leland-Gifford Drill

DRILL and **REAM** 20 deg. angle
No. 2 Leland-Gifford Drill

DRILL and **REAM** 27 deg. and 15 deg. angle
No. 2 Leland-Gifford Drill

DRILL and **REAM** (8) 0.266 & (1) 0.264; **COUNTERBORE**
and tap (1) 5/16-24 holes
No. 2 Leland-Gifford Drill

COUNTERSINK 8 holes
No. 2 Leland-Gifford Drill

INSPECT
Bench

CHAMFER, UNDERCUT, correct lengths
16 x 30 in. Reed Prentice lathe

FINISH GRIND shaft diameters
16 x 36 in. Norton plain grinder

FINISH GRIND crankpin diameters
20 x 72 in. Norton pin grinder

HOB splines
24 x 8 in. Gould & Eberhardt gear cutter

CHAMFER sides of spline end
Bench

GRIND splines
20 in. Fitchburg spline grinder

INSPECT
Bench

GRIND 2 5/16 x 12 threads
8 x 48 in. Jones & Lamson thread grinder

GRIND 2 3/4 x 12 threads
8 x 48 in. Jones & Lamson thread grinder

GRIND 3 1/4 x 16 threads
8 x 48 in. Jones & Lamson thread grinder

CUT OFF excess end and **RE-CENTER**
16 x 30 in. Reed Prentice lathe

FORM radius—shaft hole
16 x 30 in. Reed Prentice lathe

BURR, remove spacer (break edges 0.005-0.010)
Bench

POLISH pin hole
Bench and flexible shaft grinder

FORM radii—all drilled holes
Bench and flexible shaft grinder

POLISH splines
Bench

POLISH slot
Bench

BRUSH threads
Polishing jack

POLISH shaft holes—both ends
Bench

WASH
Spray booth

Magnaflux TEST
Magnaflux equipment

WASH
Tank

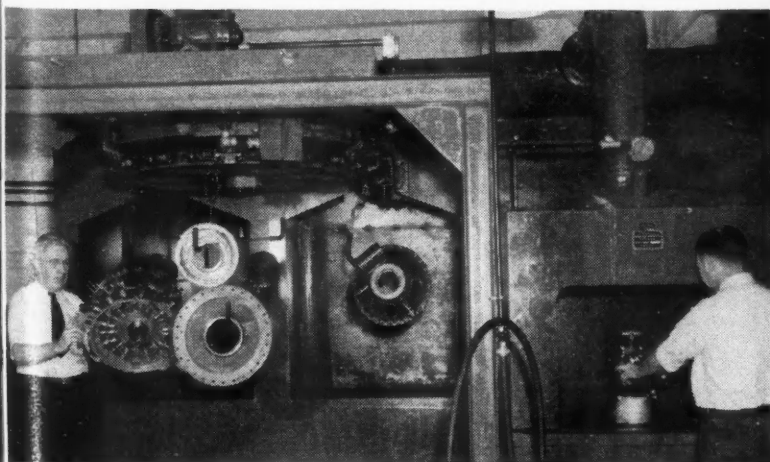
INSPECT
Bench

CLEAN and **GREASE**
Bench

OIL and **WRAP**
Bench

(Right) This is one of the huge 8-station Bullard Multi-Au-Matics installed in this plant. The operation is that of turning cylinder barrels. Note the Bull-Dog power duct installation overhead.

(Below) In the engine final assembly department. Upon completion of the test schedule in the test cells, the engines are torn down for inspection. This view shows a torn down engine going through the Detroit Rex washing machine.



General view of part of the comprehensive heat treating department which is equipped with the latest types of heat treating devices. The operating cycle of each of the furnaces is automatically controlled within close limits as to time and temperature.

are taken on each pair of flats, the cylinder being advanced by a manual indexing fixture. About 9/16 in. of metal is removed in the three passes, the final dimension being held to close limits.

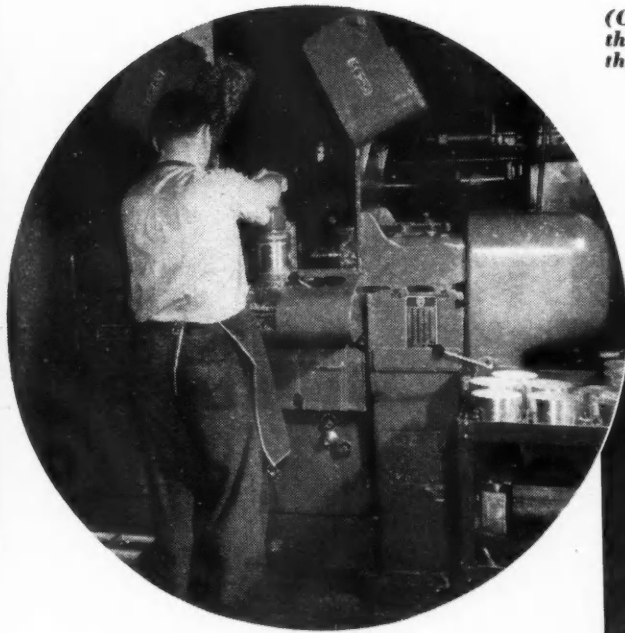
As mentioned earlier, Gisholt Simplimatic automatic lathes are used on a variety of parts including the machining of the cast steel flywheel for medium tank engines, the front and rear sections of the aluminum crankcase, and on the master rod. The flywheel job is tooled with cemented-carbide, while the crankcase sec-



Factory Routing of Cam-Intake and Exhaust

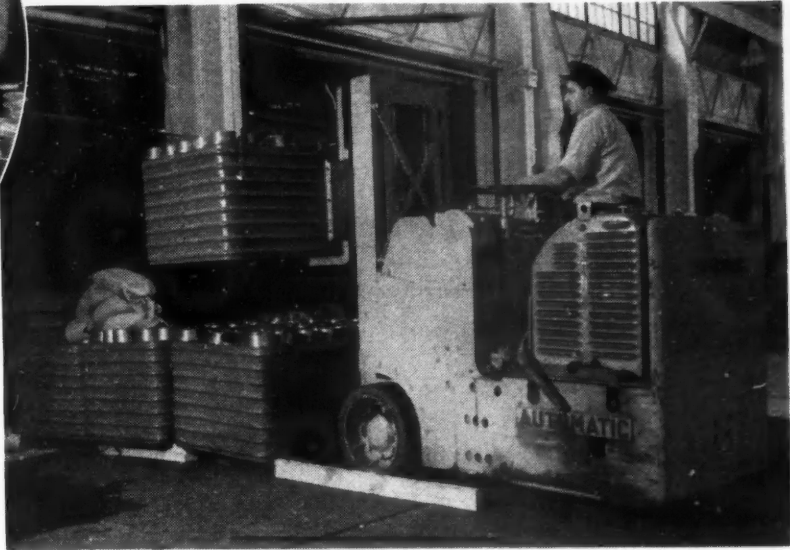
OPERATION AND EQUIPMENT

INSPECT forging Bench	TREAT test piece Furnace and bench
NORMALIZE Leeds & Northrup furnace	INSPECT case Bench
SAND BLAST Sand blast	SAND BLAST Sand blast
CLEAN spot Bench	STRIP copper plate Plating equipment
INSPECT Bench	HARDEN Furnace and Gleason quench press
Rough TURN, FACE, GROOVE and COUNTERBORE carrier Gisholt Simplimatic	DEGREASE Degreaser
Rough BORE, COUNTERBORE, FACE and CHAMFER Gisholt Simplimatic	CHECK Bench
Finish COUNTERBORE, FACE, GROOVE and CHAMFER Gisholt Simplimatic	DRAW Low draw furnace
Finish FACE, TURN, GROOVE and COUNTERBORE Gisholt Simplimatic	SAND BLAST Sand blast
TURN backface of gear 16 in. LeBlond lathe	CADMIUM FLASH Plating equipment
BURR Bench	CLEAN spot Bench or grinder
WASH Washing machine	INSPECT Bench
INSPECT Bench	GRIND faces and I.D. Heald internal grinder
Copper PLATE Plating equipment	GRIND gear face No. A-3-16 Arter surface grinder
GRIND side of gear No. A3-16 Arter surface grinder	DEMAGNETIZE Spaulding demagnetizer
DEMAGNETIZE Spaulding demagnetizer	GRIND bottom diameter—radius and side of gear Landis cam grinder
Finish GRIND O.D. of gear Norton grinder	GRIND bottom diameter radius and sides of cams Landis cam grinder
ROUGH CUT gear teeth Fellows No. 61-A gear shaper	GRIND gear teeth No. 35-16 Grinder—Gear Grinding Machine Co.
MILL profile of cams Van Norman cam miller	DRILL and REAM (15) holes No. 2 Leland-Gifford drill press
Rough GRIND cam profile Landis cam grinder	CHAMFER 15 holes No. 2 Leland-Gifford drill press
Rough GRIND sides of cam Landis cam grinder	LAP gear teeth No. 13LS Fellows lapping machine
REMOVE BURRS Bench	Tampico BRUSH gear teeth Polishing jack
WASH Washing machine	BREAK sharp edges Bench
INSPECT Bench	WASH Washing machine
Gas CARBURIZE and ANNEAL Gas carburizing furnace	MAGNAFLUX test Magnaflux equipment
	INSPECT Bench



(Circle) This double-end Heald Bore-Matic is employed for the precision-boring of wrist pin holes in pistons. Note the machine guards hinged out of the way to permit free loading of the work in the fixture.

(Below) Transportation of rough and finished materials is facilitated with a battery of factory trucks, this versatile Automatic Transportation 4000-lb. tiering truck being a good example of this practice.



tions are tooled with super high-speed-steel. The flywheel has 102 internal gear teeth of 6/8 pitch, with 3-in. width of face, cut on Fellows 61-A gear shapers, in two operations. The flywheels are located in specially designed fixtures which assure absolute concentricity of pitch diameter of the gear with the bearings.

On the master rod, the Gisholt Simplimatics are used for rough-facing, rough boring, semi-finish turning, and related operations, being tooled with steel cutting grades of cemented-carbides. Gisholts also are used for finishing the faces, finish-turning, finish boring and turning on both the short and long hub sides of the master rod.

The shaping and forming the profile and contour of

the master rod from the rough forging are performed on Cincinnati Hydro-Tel and K & T milling machines. One of the Hydro-Tel operations is that of finish-milling the channels from the small and clear around the entire periphery and back to the small end. This entails a stock removal of 1/16 in. on all surfaces. This machine is provided with a 360 deg. automatic tracer controlled attachment, the finger of the tracer following the master which is held in a fixture at the end of the table. This motion then is transferred to both the table and the cross movement of the ram. Initially, a Hydro-Tel four-spindle milling machine is used for rough milling the outer form of the rod. In this operation, four rods are held in a fixture, with the long hub down, all four being roughed out simultaneously.

A single head Van Norman contour milling machine is used for milling crankshaft counterweights, with two pieces loaded at a time, the entire periphery being finished in one setting. Head and work-spindle operation are controlled hydraulically, with hydraulic pressure applied to keep the rollers and cam in intimate contact. These counter-

(Turn to page 86, please)



This battery of Fellows gear shapers of various types in the grinding department is but a glimpse of the many Fellows machines installed in the Continental plant.

1942 Gear Shift

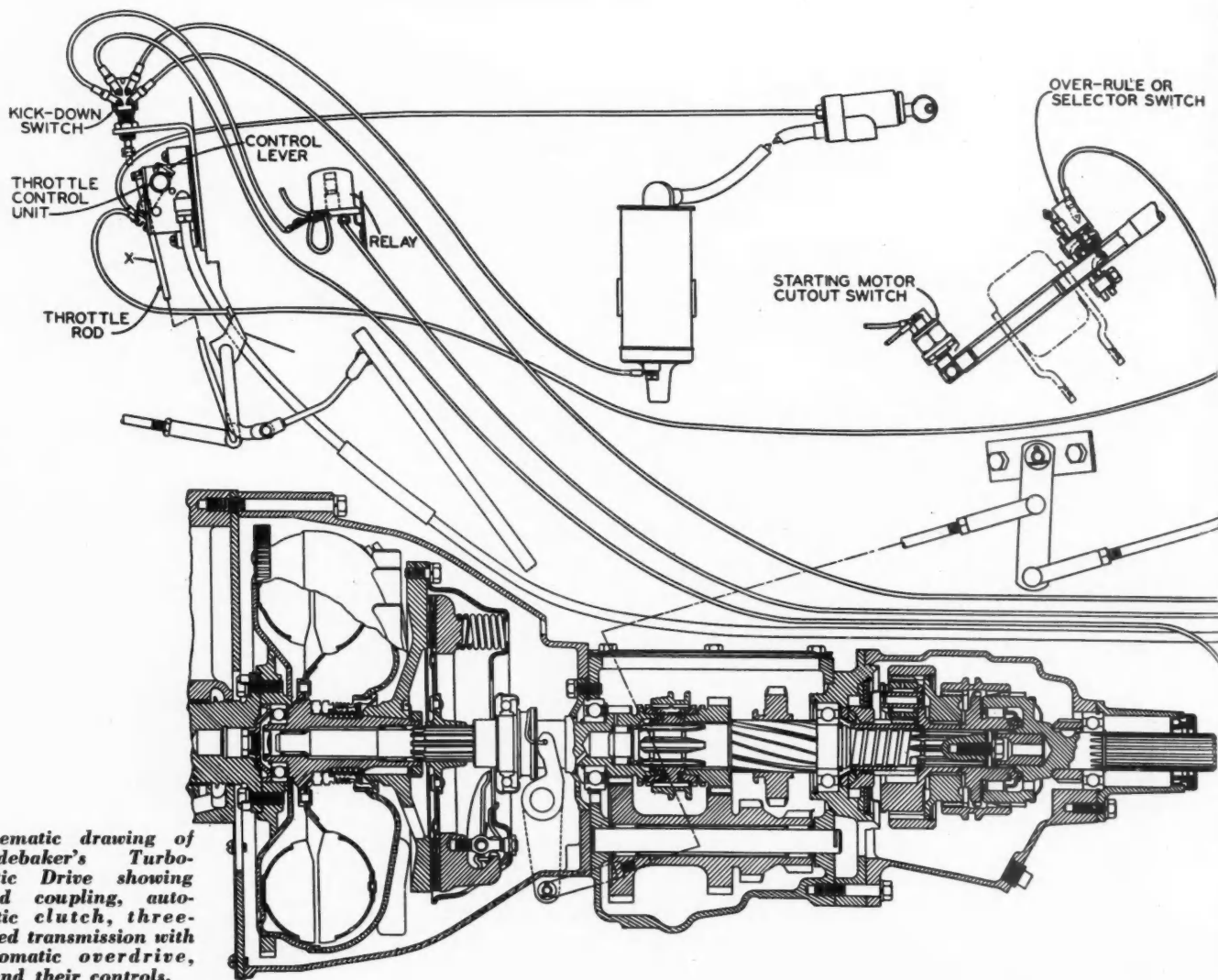
FOR 1942 practically the entire industry for the first time has something to offer in the way of hydraulic drives in combination with automatic, semi-automatic or power-actuated transmissions. Previously successful designs were introduced by Packard, General Motors and Chrysler. To this list now is added Studebaker, Ford and Hudson. Studebaker makes available the Turbo-Matic Drive, Ford the Liquamatic Drive on its Lincoln and Mercury cars, and Hudson the Drive Master system. In most cases these gear-shift innovations are optional at extra cost.

In the following columns are described the new transmissions and their control systems together with the changes that have been made in the others. These new transmissions not only make control or operation

easier, but also make possible fuel saving and less wear because they incorporate an overdrive or four forward speeds in combination with a low ratio rear axle. Some important contributions to these 1942 transmission developments have been made by certain firms in the parts industry, notably the Warner Gear Division of Borg-Warner Corp. and Bendix Products Division of Bendix Aviation Corp.

Studebaker

STUDEBAKER this year equips its two heavier series optionally with what is termed the Turbo-Matic Drive, which comprises a fluid coupling, a friction clutch controlled by means of inlet-manifold vacuum, a three-speed constant-mesh transmission and an automatic overdrive with solenoid control sensitive to car



Schematic drawing of Studebaker's Turbo-Matic Drive showing fluid coupling, automatic clutch, three-speed transmission with automatic overdrive, and their controls.

Developments

speed. A schematic drawing of the complete system, with the various parts in section, is shown herewith.

The friction clutch is released by a power unit mounted on the frame, consisting of a diaphragm chamber of which one side can be placed in communication with the inlet manifold by means of a solenoid-controlled valve. This part of the system also includes a balancing valve which provides a cushion for the clutch when being engaged.

When the power-unit solenoid is energized (in the drawing it is shown in the de-energized position), plunger A is raised to operate a valve which closes passages C to the engine manifold. Inlet-manifold vacuum is then admitted to side D of the power unit, and the clutch is released. In the drawing the power unit is shown in the position corresponding to clutch engagement. A simple linkage connects the power unit to the clutch-release shaft.

Two separate electrical circuits control the power-unit solenoid, and neither circuit can be completed

unless the throttle is closed. Circuit I passes through the "governor"; circuit II, through the over-rule switch.

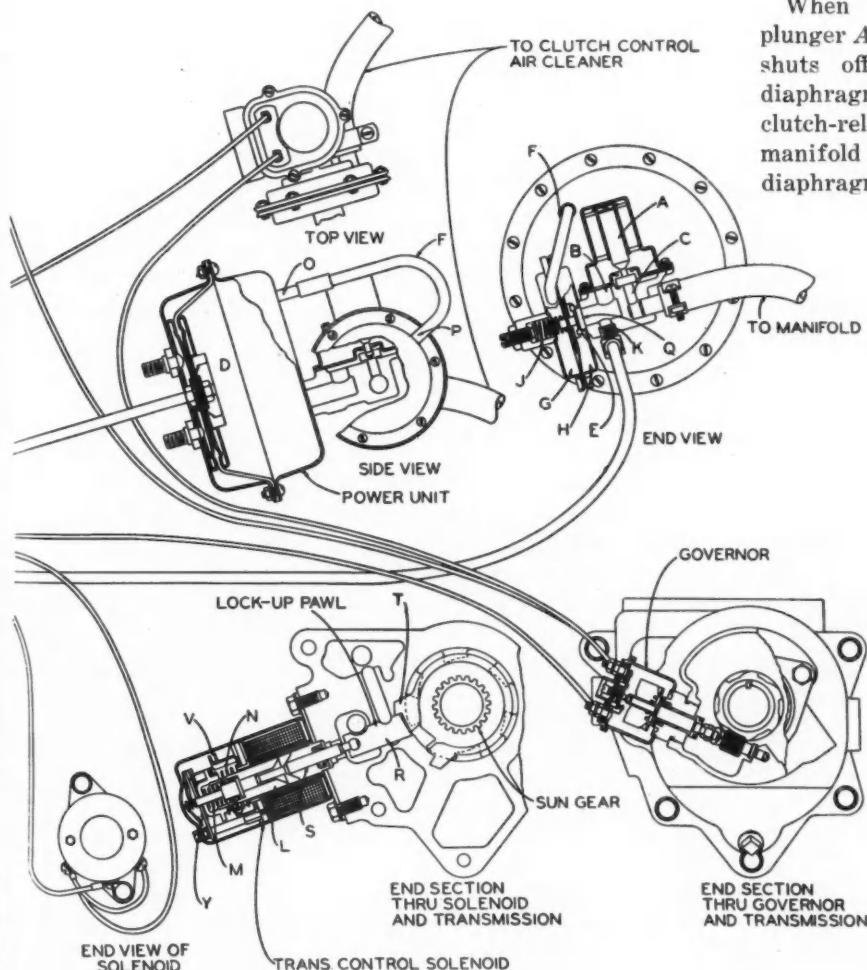
The governor, driven by the speedometer-drive gear in the transmission, has two sets of contact points. In the drawing the governor is shown in the position corresponding to zero speed. One set of contacts—for one of the power-unit solenoid circuits—is in contact until a car speed of about 15 m.p.h. is reached, at which speed the contact is broken, thus interrupting the circuit to the power-unit solenoid. During deceleration, the governor contacts close at a car speed of about 6 m.p.h., hence, with the throttle closed, when the car speed drops below 6 m.p.h. the circuit to the power-unit solenoid will be completed and the clutch released.

The other circuit passes through the over-rule or selector switch, which is mounted on the gear-shift controls on the steering column. Initial movement of the shift lever completes the circuit, and the clutch is thus released before the gear change is started. The circuit is broken by a return spring as soon as movement of the shift lever ceases.

When the power-unit solenoid is de-energized, plunger A is moved downward by spring pressure. This shuts off engine vacuum from the clutch-control diaphragm and opens passage B to the D side of the clutch-release diaphragm. Passage F admits inlet-manifold vacuum to the G side of the cushion-valve diaphragm. Atmospheric pressure acts against the H side. As long as the difference between atmospheric pressure H and vacuum G exceeds the tension of spring J, valve E remains open and admits air to the power unit. However, this action can take place only if plunger A is in the "down" or de-energized position. With plunger A pulled up, the B passage is closed and no air can get into the system.

The cushion valve serves to balance the vacuum in the power unit against the cushion-valve spring. The pressure of this spring can be adjusted by means of a screw and is made equivalent to about 4½ in. of mercury. With this amount of vacuum in the power unit, the clutch is just engaged. Because of restrictions at points O, P and Q, the cushion-valve action is not instantaneous, hence clutch engagement is gradual.

The action thus described is that which would occur if the throttle remained closed. In actual driving, however, the throttle will be opened either



gradually or quickly, and this has a supplementary effect on clutch engagement, through a control in the throttle mechanism.

Before describing the throttle-control unit, it will be best to consider the conditions under which the power-unit solenoid is energized (circuit completed and clutch released) and de-energized (circuit broken and action of cushion valve started). To energize the power-unit solenoid (1), the transmission governor closes the circuit at car speeds below 6 mph. and (2) the over-rule switch on the gear-shift closes the circuit as soon as the gear-shift lever begins to move. The solenoid is de-energized when (1) initial movement of the throttle (accelerator pedal) from the closed position breaks the circuit regardless of other controls; (2) above 15 mph. the transmission governor opens the circuit, and (3) whenever movement of the gearshift lever ceases the circuit through the over-rule switch is opened.

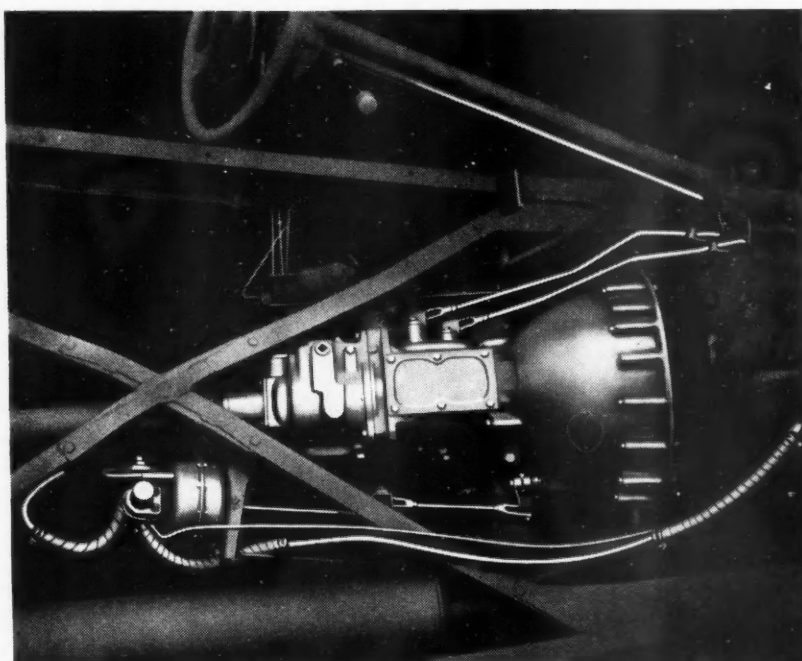
At speeds below 6 mph. clutch engagement can occur only when the throttle is opened.

A dash-mounted combination air-control valve and switch is connected in the throttle linkage (in the drawing the throttle is shown in the closed position). Initial movement of the control lever (3 to 4 deg.) separates a pair of contact points, thereby interrupting the circuit of the power-unit solenoid and starting action of the power-unit cushion valve. Between 7 and 8 deg. movement of the lever, the air valve starts to open, admitting atmospheric pressure to passage *K* of the power unit, and then to the *D* side of the power-unit diaphragm. This modifies the action of the cushion valve. The rate of clutch engagement depends on how fast or how far the driver pushes the accelerator pedal. For a slow start the pedal is pushed down gradually, and clutch engagement then also is gradual. For a fast start the pedal is pushed down quickly.

Continued movement of the accelerator pedal would result in over-travel of the throttle-control-unit lever, except for the presence of a slip joint between the operating rod and the lever. As the throttle is returned to the closed position, the slip joint automatically returns the air valve of the unit to the closed position and closes the electrical contact points.

Normal clutch engagement is governed by the power-unit cushion-valve action, modified by the rate and extent of throttle opening. However, at speeds above 15 m.p.h. clutch engagement will occur as the gear-shift is completed, even though the throttle is not opened again. Under this condition, clutch engagement will be slower than when it is controlled by the driver through throttle operation.

On acceleration, the governor points separate at about 15 m.p.h., but on deceleration they do not close again until the speed has dropped 6 m.p.h. Hence, after the car has reached a speed of over 15 m.p.h., the governor will start action of the power-unit cushion



Turbomatic drive as installed in the Studebakers.

valve after completion of the shift, down to 6 m.p.h.

To prevent starting the engine with the transmission in gear, a switch is provided in the starter motor relay circuit, mounted at the lower end of the gear-shift controls, which prevents operation of the starting motor unless the gear-shift lever is in the "neutral" position. A key on the gear-shift shaft depresses a ball in the switch only when the shift lever is in the neutral position. This action closes switch contacts and permits operation of the starting motor.

The transmission, in conjunction with the automatic clutch, is semi-automatic in action and requires a minimum of gear shifting. City driving is ordinarily in the "traffic range" (second gear) and road driving in the "cruising range" (high gear) with only one manual shift involved. Two ratios under direct driver-control are available in each range.

The forward gear case is similar to that used with the overdrive transmission on prior Studebaker models. Helical gears are used throughout, with three forward ratios. Synchronizer and blocker-ring action assure quiet gear action in both second and direct ratios. The overdrive gearing contained in the rear case is quite similar to that previously used. In places of overdrive engagement by centrifugally actuated pawls, the gearing is in the overdrive ratio at all times. A single pawl actuated by a solenoid and blocker ring locks the sun gear for overdrive and unlocks it for direct drive.

Overdrive is available in all forward speeds above about 15 m.p.h., but ordinarily will be used only in "traffic" and "cruising" ranges. The solenoid is energized to provide overdrive above speeds of 15 m.p.h., and de-energized at lower speeds to give the conventional ratio. It also can be de-energized by a throttle-actuated switch to obtain the conventional ratio at the option of the driver (by pushing the accelerator pedal clear down). A relay is included in the circuit to reduce the amperage flow in the switch circuit.

At a speed of approximately 15 m.p.h., the governor points close to complete the relay circuit, thus energizing the solenoid coil. A momentary current of 35 amperes act on plunger L, pulling it into the solenoid and loading springs M and N. As this occurs, points V are separated, thus cutting out the main winding (35 ampere draw) and cutting in a "holding" coil (2½ ampere draw), which is sufficient to hold the plunger in the solenoid against the action of springs M and N. The "holding" coil is necessarily energized during the entire period of overdrive engagement. This action does not move pawl R attached to rod S, because blocker ring T prevents pawl movement. However, spring M is now pre-loaded, ready to move the pawl into engagement with the sun gear lock-up as soon as the blocker ring unlocks by torque reversal. This is accomplished by momentarily releasing the throttle, a necessary prerequisite for any overdrive engagement. In the drawing, the solenoid and pawl are shown in the direct-drive position.

As the car coasts down to speeds below approximately 6 m.p.h., the governor points separate, thus opening the relay circuit and de-energizing the transmission control solenoid. Tension of spring N pulls the pawl out of the lock-up position, so returning the transmission to the conventional ratio.

In a similar manner, as with previous overdrive transmissions, the driver can return to the conventional ratio at any time by pushing the accelerator pedal clear down (past the wide-open-throttle position). In going past the wide-open-throttle position, throttle rod X contacts the plunger on the "kick-down" switch. There are two sets of contacts and two circuits through this switch. One set is in the transmission-solenoid-relay circuit and the other in the circuit from the ignition coil to contact points Y of the transmission solenoid. The first set is normally closed, the second set open. At kickdown, the reverse occurs; the first set is open, the second set closed.

As the first set separates, the transmission solenoid circuit is broken and the transmission solenoid thus de-energized. Spring N is then free to pull pawl R out of the lock-up position. The pawl is held by engine torque until the second set of points "closes." As this occurs, the ignition coil is grounded at points Y in the transmission solenoid; torque load is taken from pawl R and spring N pulls the pawl out of the lock-up position, returning the transmission to the conventional ratio.

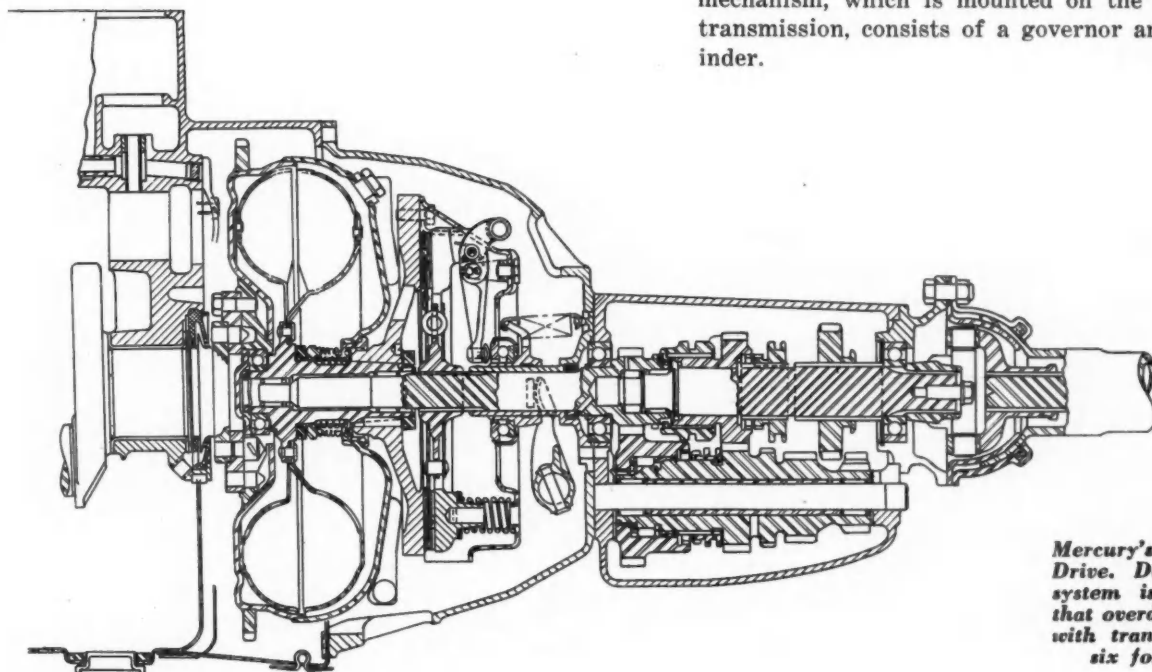
As rod S flies outward (position shown in drawing) contact points Y separate and the ignition circuit is restored. This action actually occurs in a fraction of a second, hence the driver is hardly conscious of an interruption in the drive.

Mercury and Lincoln

THE NEW Liquamatic Drive, which is available as extra equipment for Mercury and Lincoln cars, basically consists of a fluid coupling, conventional clutch and semi-automatic transmission. In addition, the Lincoln system has an automatic overdrive in combination with its transmission.

Mercury's Liquamatic transmission differs from a three-speed conventional unit by having an over-running clutch on the countershaft drive gear, which also is equipped with a "lock-up" device to permit using the engine as a brake or for starting the engine by pushing the car. The "lock-up" takes place when the gearshift lever is placed in conventional second gear position, which makes the semi-automatic mechanism inoperative with the transmission in second gear.

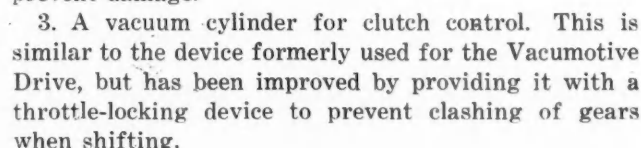
For ordinary driving in traffic or on the road the gearshift lever is placed in the Driving Range position, which is the same as for high gear with a conventional transmission. This operation disengages the conventional clutch. When the accelerator pedal is depressed, the car starts in a special ratio second gear and at about 12 m.p.h. a momentary release of the accelerator results in the shift to high gear. This shift control mechanism, which is mounted on the outside of the transmission, consists of a governor and vacuum cylinder.



Mercury's new Liquamatic Drive. Design of Lincoln system is similar except that overdrive is combined with transmission to give six forward speeds.

Lincoln also has available at extra cost an overdrive unit for use with its regular transmission. It is controlled by a solenoid of the push type and energized by a centrifugal switch driven from the output shaft of the overdrive unit and, therefore, in proportion to the car speed. With this push-type solenoid the pawl is pulled out of engagement by a spring and pushed in by the solenoid. When the pawl engages, the planetary assembly begins to operate and the car is in overdrive.

A special feature of the Hudson system is that it gives the driver the choice of three control methods. All normal driving can be done without manual gear



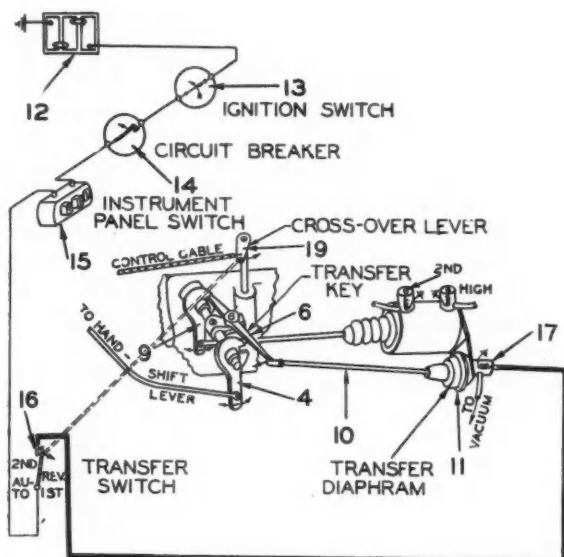
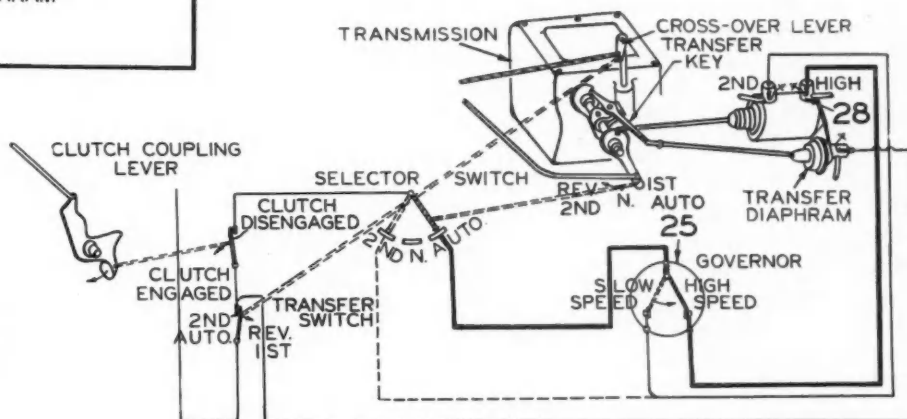


Fig. 2—(Above) This view shows additional parts introduced into system (Fig. 1) to prepare for power shifting.

Fig. 4—(Right) Governor switch contact in high speed position closes circuit to high gear solenoid (28).



4. A transmission-switch assembly, bolted to the side of the transmission, on which there are four levers from which link connections are made to the transfer switch, the clutch switch, the selector switch, and the neutral-and-limit switch.

5. A governor switch operated by a centrifugal governor driven from the speedometer gears. This switch

contains two pairs of contacts and controls the speeds at which the shift from pick-up to high gear and that in the opposite direction are made, and it also controls the operation of the Vacuum clutch control.

6. A power unit assembly comprising a power gear-shift cylinder and a transfer diaphragm assembly mounted on a support plate along with a solenoid selector-valve assembly which controls their operation. The piston of the power-shift cylinder connects to the shift lever on the transmission by a rod, the piston and rod being moved axially by the admission of inlet-manifold vacuum to either end of the cylinder. The transfer diaphragm also is operated by inlet-manifold vacuum and serves to connect the proper

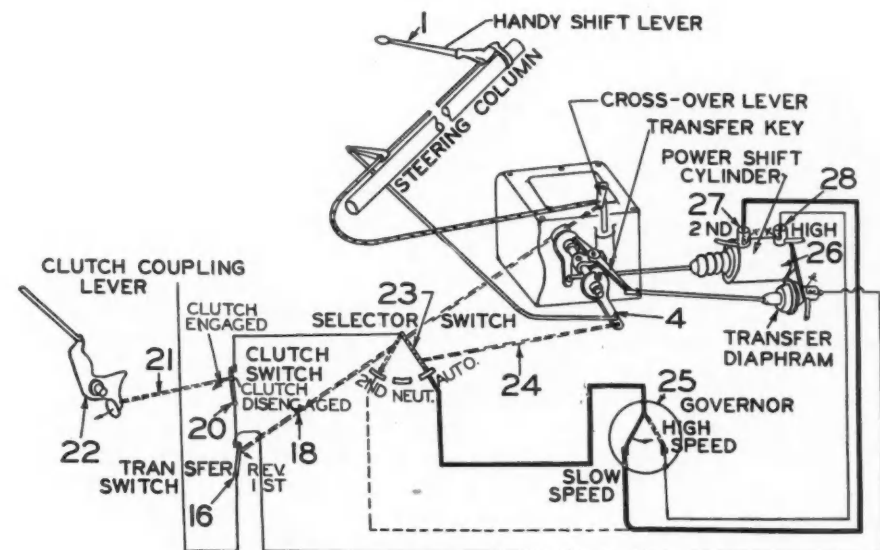


Fig. 3—Complete system for power shifting. Governor switch contact (25) is shown on slow speed side.

parts in the shifting mechanism to permit either manual or power gear shifting. Manual shifting of gears is effected by means of the shift lever on the steering post from which there is a mechanical connection to both the cross-over lever on top of the transmission and hand-shift lever 4 on the side thereof, the former being actuated by an up-and-down, the latter by an angular or pivotal motion of the shift lever. However, hand-shift lever 4 is mounted loose on shift shaft 5, and in order to make it possible to turn shaft 5 by means of lever 4, a transfer-key 6 is pivoted on transfer-key hub 7 secured to the shaft by a set screw. Power-shift lever 9, with which the transfer key is engaged for power shifting, is also free on the shift shaft. In Fig. 1, rod 10, which is under the influence of a spring in diaphragm chamber 11, holds transfer key 6 in engagement with handshift lever 4.

If now the driver wants to change over to power shifting, he presses down on the button marked "HDM" on the instrument-panel switch (Fig. 2). Current then flows from bat-

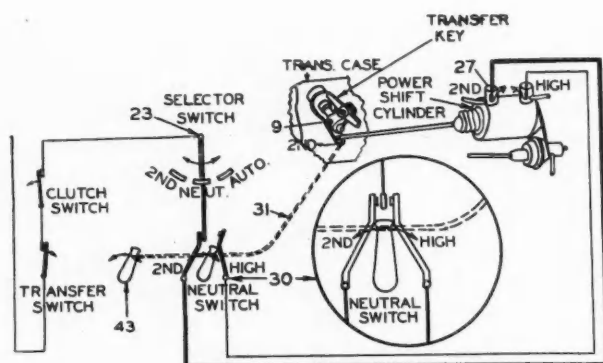


Fig. 5—Neutral switch (30) for stopping shift in neutral when going into low or reverse. Neutral switch and Power shift lever (9) are shown in high gear position.

tery 12 through ignition switch 13, circuit breaker 14, instrument-panel switch 15 and transfer switch 16 to the solenoid of transfer diaphragm valve 17, transfer switch 16 being closed by transfer lever 19 through rod 18 when the driver makes the selecting motion with the shift lever on the steering post from neutral to the "second high" side. When solenoid 17 is energized the valve admits vacuum to diaphragm chamber 11 and the vacuum pull on the diaphragm then pulls transfer key 6 out of engagement with hand-shift lever 4 and engages it with power-shift lever 9.

While the system is thus prepared for power shifting, certain additional units are required to accomplish it, and these are shown in Fig. 3. They include clutch switch 20 connected to clutch coupling lever 22, and selector switch 23 operated from hand-shift lever 4 through rod 24. Also shown in the drawing are governor switch 25 and power-shift cylinder 26, with second-gear solenoid 27 and high-gear solenoid 28. In Fig. 3 the shift lever is shown in the second-high position, hence transfer switch 16 is closed and the circuit established up to clutch switch 20. When the clutch is disengaged the clutch switch is closed through its connection to clutch-coupling 22 by operating rod 21. The circuit is now completed through the automatic side of selector switch 23 to the slow-speed contacts of governor switch 25 and second-gear solenoid 27. As second-gear solenoid 27 is energized, vacuum is admitted to the front end of power-shift cylinder 26, and as the transfer key 6 is engaged with power-shift lever 9, second gear is engaged. As soon as the shift is completed, and the clutch is engaged, the circuit through second-gear solenoid 27 is broken at the clutch switch, whereby the solenoid is de-energized.

In Fig. 3 the governor-switch is shown closed on the low-speed side, indicating that the car is operating at low speed, in which case the circuit is completed through the second-gear solenoid. When a higher speed is reached, the governor will automatically break the circuit through the second-gear solenoid and close that through the high-gear solenoid 28. This causes a power shift into high gear.

The driver may want to shift to second gear while the car is traveling in the high-gear range, and to make this possible, a by-pass circuit to the governor is provided (Fig. 4). By moving the shift lever to the second-gear position he closes the second-gear contacts in selector switch 23, through the intermediary of a linkage thereby completing the circuit through second-gear solenoid 27. The shift into second gear then takes place regardless of car speed.

A neutral switch 30, Fig. 5, makes it possible to stop in the neutral position when turning shift-shaft 5. It is operated by neutral-and-limit-switch rod 31 from power-shift lever 9. In Fig. 5 lever 9 and switch 30 are shown in the high-gear position, while selector switch 23 has been moved into neutral by means of the shift lever. The circuit through second-gear solenoid 27 now being completed, a power shift toward second gear begins, but when the neutral position is reached the cam of neutral switch 30 separates the contacts (as shown by the duplicate view of the neutral switch to the right of its regular position) and the

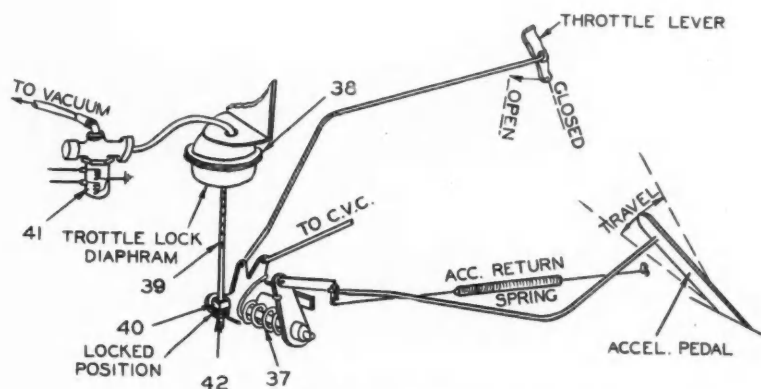


Fig. 6—Throttle locking device in locked position.

shift proceeds no farther.

Another auxiliary mechanism is the throttle-locking device, which prevents the application of power before a shift has been completed. Referring to Fig. 6, whenever a power shaft is made, solenoid 41 is energized and admits vacuum to throttle-lock diaphragm-chamber 38, pulling up on cable 39 until the two lock nuts at the lower end of the cable contact swivel block 40. If the accelerator pedal is depressed when the throttle lock is in this position, the pressure exerted merely winds up bellcrank spring 37. This diaphragm is always subjected to vacuum when a shift is being made, and remains so until it is completed. The diaphragm-cable nuts must be so adjusted that the throttle can be opened wide, yet will lock when the diaphragm is subjected to vacuum.

Action of throttle-lock solenoid 41 is governed by a limit switch 43 containing two sets of contacts. The limit switch is actuated by the power-shift lever on the transmission through a connecting link. Assuming the transmission to be in high gear and the car to be running at below the shifting speed into high gear, the governor switch will be in a position which results

in the shift to second gear. The circuit through the governor switch also passes through the limit switch, in which the high-gear contacts are now separated and the second-gear contacts closed. This completes the circuit through one of the windings of solenoid valve 41, energizing that solenoid and locking the throttle through the cable connection. When the shift to second gear has been completed, the cam in the limit switch opens the second-speed contacts, de-energizing the solenoid valve 41 and allowing the throttle to open. As the limit-switch cam passes through the neutral position on its way to second-gear position, the high-gear contacts are closed, thereby preparing the throttle-lock circuit for a shift into high gear. A second winding in the throttle-lock solenoid is actuated during this shift.

The limit switch already referred to is similar to and combined with the neutral switch, and the cam for the former is shown in Fig. 5, where the transmission is shown in the high-gear position. If now the car should slow down to below the high-gear shifting speed, the governor switch opens the high-gear and closes the second-gear contacts, thereby completing the circuit to one of the windings in solenoid valve 41. The solenoid is energized and vacuum is admitted, which pulls the throttle-lock cable up into the locked position. When the shift to second gear has been completed, the cam in the limit switch opens the second-gear contacts, de-energizing solenoid 41 and permitting the throttle to open. As the limit-switch cam passes through the neutral position on its way to second-gear position, the high-gear contacts are closed, thus preparing the throttle lock for a shift into high gear. A second winding in the throttle-lock solenoid is actuated during this shift.

Another Design Ready

A FLUID-DRIVE semi-automatic transmission scheduled is to be offered by another manufacturer after the first of the year. The engine will carry a fluid flywheel or fluid coupling of conventional design, and back of this will be mounted a friction clutch which normally will be operated by vacuum power. The transmission is a regular three-speed design, with column-mounted shift lever, but the low speed is not to be used in ordinary driving. Shifting between second and high is effected automatically by a governor-controlled vacuum power unit.

In operation, supposing the car to be standing still with the engine idling, the driver places the shift lever in the forward position. He then presses down on the accelerator pedal, and the first movement of that pedal, before the throttle valve begins to move, causes the friction clutch to engage firmly. Further movement of the throttle causes the engine to speed up and the car to be started by the fluid clutch. At any speed above 15-17 mph., the accelerator pedal is momentarily released, the transmission automatically shifts into high. When rapid acceleration is required the driver presses down hard on

the accelerator pedal, whereupon the shift into the starting gear will occur automatically—at any speed up to about 38 mph. At higher speeds a “wind switch” actuated by the air pressure, comes into operation and prevents shifting down. While driving slowly in traffic or decelerating, the transmission remains in high gear until a speed of about 10 mph. is reached; below that speed it shifts automatically into the starting gear.

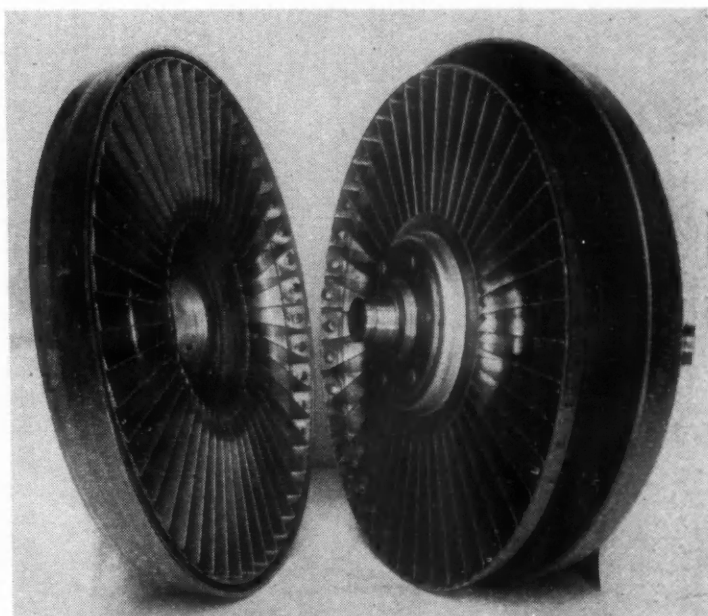
When coming to a stop in traffic with the throttle closed, the friction clutch is disengaged automatically by the vacuum power unit, hence there is no tendency to creep due to the drag of the fluid coupling. The friction clutch remains disengaged until the accelerator is depressed again.

A clutch pedal is provided for use when parking, backing or maneuvering, as operation with the fluid clutch under such conditions is rather critical. By pressing down on the clutch pedal the vacuum clutch control is cut out and it does not come in again until the pedal is released.

Chrysler and De Soto

CHRYSLER'S Vacamatic transmission, which is standard equipment on the Crown Imperial and available on other models with Fluid Drive, is the underdrive, semi-automatic type. In addition to reverse, it has four forward speeds and two gearshift lever positions—high range and low range with two gear ratios each. The overdrive used on Chrysler 8-cyl. models in 1941 has been discontinued. As optional equipment at extra cost, De Soto continues to offer Fluid Drive and the Simplimatic transmission, which is the same type as the Chrysler Vacamatic unit.

The Fluid Drive unit on Chrysler 6-cyl. and De Soto models has been improved to increase its efficiency, especially at low engine speeds, thereby reducing slippage throughout the driving range and assuring quieter operation. The number of fins on the drive

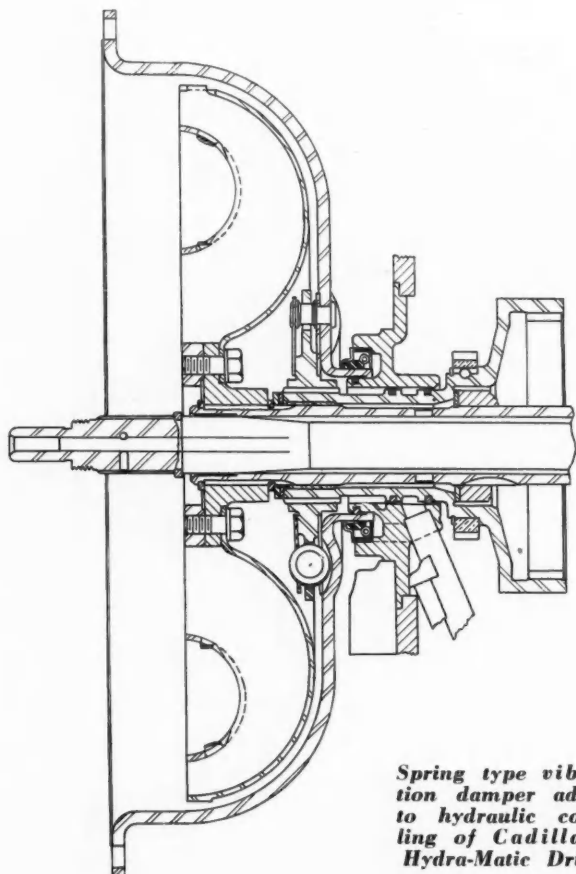


Improved driver and runner units in the Fluid Drive of Chrysler 6-cyl. and De Soto models.

member has been increased to 48 and on the runner to 44. The shape of the driver has been changed so that less reservoir oil space is needed and operating efficiency improved. My improving the shape of the center baffle plate, the flow of oil from driver to runner is increased by throwing the oil outward through centrifugal force directly into the vanes of the runner.

Cadillac and Oldsmobile

CADILLAC for the 1942 season will furnish its cars either with the standard three-speed-and-reverse transmission or with the Hydra-Matic transmission and fluid coupling as an optional extra. The Hydra-Matic transmission remains substantially the same as in 1941, but a few improvements have been made, the most important among which is the provision of a vibration damper in the driving member of the hydraulic coupling. This is illustrated by the drawing reproduced herewith. Eight springs, *S*, are driven from the flywheel member *F* by pins *P* to which friction plates *R* are riveted. The operation of the device is similar to that of the spring damper used in the driven discs of friction clutches. It has been generally held that fluid clutches absorb all torsional vibration, but Cadillac evidently has not found this to be the case. Of course, the application of the fluid clutch is different in the Hydra-Matic from that in the usual installation, in that the clutch is inserted between the first and second planetary assemblies instead of between the engine and the transmission. Moreover, only part of the power is transmitted by the hydraulic



Spring type vibration damper added to hydraulic coupling of Cadillac's Hydra-Matic Drive.

clutch and its damping effect therefore would be expected to be less.

On the Oldsmobile Hydra-Matic Drive, the reverse gear engagement is made easier by improvement of the hydraulic synchronization.

Packard

PACKARD MOTOR CAR CO. is continuing its Electromatic Drive as an optional feature for 1942, but has made a number of changes in it and also in the linkage connecting the shift lever on the steering column to the transmission. A drawing of the new linkage is shown herewith (Fig. 1). Owing to the fact that the powerplant has a flexible mounting, appreciable movement is possible between it and the steering-gear housing, from which the shifting motion must be transmitted to the gearbox. In order to ensure free and positive shifting, any such relative motion between the steering-gear housing (secured to the car frame) and the engine block must be compensated for.

Gear shifting is accomplished by means of a shift lever underneath the steering wheel, which has an up-and-down motion for purposes of selection, and an angular motion for the actual shift. Concentric shafts extending parallel with the steering column transmit the shifting motion to the base of the column, where each of the shafts is provided with a lever. From these levers there is connection by links to a pair of bellcranks mounted concentrically on a pivot pin supported by the engine block. It is in the method of support of this pivot pin on the engine block that the novelty of the Packard design lies.

A bracket secured to the side of the cylinder block is provided with a trunnion at its lower end. A cranked rod or bar serving as pivot pin is supported in this trunnion at its lower end, while its upper end is connected to the steering gear by a radius rod, so that this end is always kept at the same distance from the base of the steering column. The two bellcranks are mounted on the pivot pin, and it will be noticed that the free ends of the arms of the bellcranks, from which connection is made to the arms mounted on the steering post, are at the same level as the connection of the radius rod to the pivot pin so that the shifting mechanism will not be affected by any relative motion between engine and steering-gear housing.

The Electromatic clutch is a friction clutch which is disengaged by inlet-manifold vacuum controlled by means of an electro-magnetic valve. This year a diaphragm power chamber is used to disengage the clutch, instead of a vacuum cylinder, the former having the advantage that it eliminates piston friction and ensures a smoother and sharper engagement, with less lag. As shown by the schematic drawing (Fig. 2) of the Electromatic clutch, the diaphragm chamber is located at the side of the engine crankcase, the diaphragm having a cable connected to it which passes over a pulley on the clutch relay lever and is anchored to the starter. Cable adjustments are made at the anchored end. The rate of clutch engagement is controlled by the rate of air bleed into the vacuum chamber and not by the manifold vacuum. The rate of air bleed into the vacuum chamber is controlled by the clutch-control valve, of which a sectional view (Fig. 3)

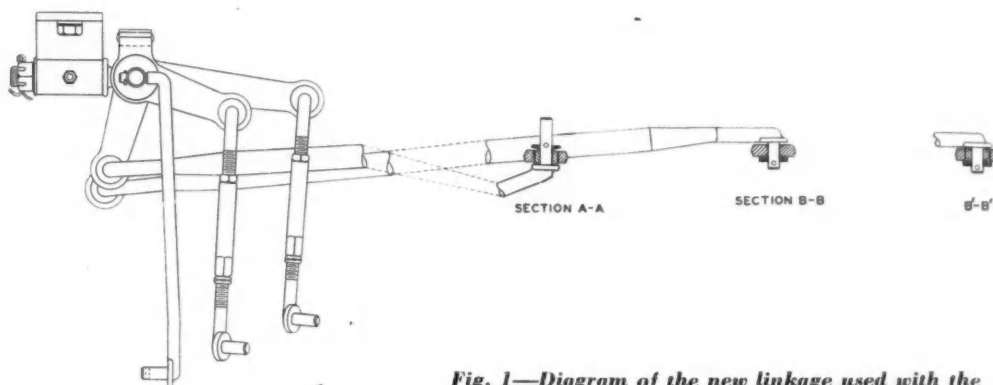
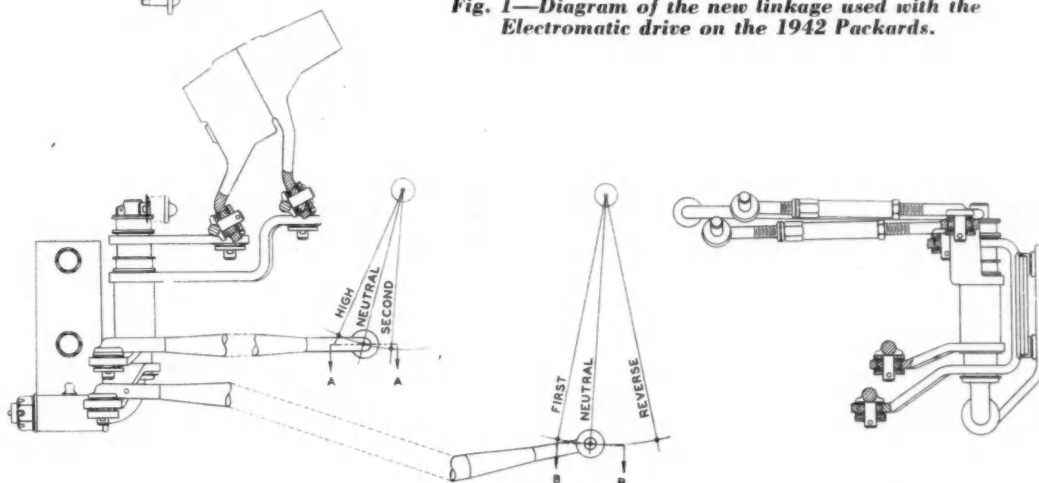


Fig. 1—Diagram of the new linkage used with the Electromatic drive on the 1942 Packards.



is shown herewith. This valve is installed in the vacuum line between the inlet manifold and the diaphragm chamber. This is a compound valve which, besides regulating the rate of air bleed to provide the desired clutch engagement, also effects engine speed synchronization. The inner valve, referred to as the spool, connects to the accelerator pedal through a compound linkage. This is surrounded by a sleeve, which is operated by a spring-loaded diaphragm subjected to the same vacuum as the diaphragm in the power chamber.

As the accelerator pedal is depressed, these two valve elements move relative to each other to shut off the vacuum and bleed air into the power chamber at the proper rate for clutch engagement for normal conditions of operation. By means of a switch on the instrument board the Electromatic clutch can be locked out, the clutch then being operated by foot in the usual manner. The primary mechanism for operating the clutch—a diaphragm power chamber and an electro-magnetic valve for admitting vacuum to the chamber and bleeding air into it—are quite simple, but a number of switches and electrical relays are required to ensure that this mechanism shall operate properly under all driving conditions. The switches are operated automatically by the shifter rails of the transmission and by a centrifugal switch or governor switch turning at a speed directly proportional to car speed. A circuit diagram of the Electromatic clutch is shown herewith (Fig. 4). Referring to this diagram, a two-unit relay is mounted on the forward side of the dash to operate the solenoid controls. Closing a switch

completes the circuit and causes a light current through the relay. This current energizes the relay and closes a set of contact points which allows a heavy energizing current to flow in the solenoid circuit. All of the electrical units of the system, with the exception of the second-speed switch, are energized through the relay.

A solenoid shut-off valve is built into the vacuum supply line at the clutch-control valve. When the solenoid is de-energized, the valve is closed and vacuum is shut off from the diaphragm power chamber, so that

the Electromatic mechanism is inoperative. The direct-drive solenoid valve is electrically controlled through the lock-out, direct-drive, accelerator and governor switches. The lock-out switch, when in the "out" posi-

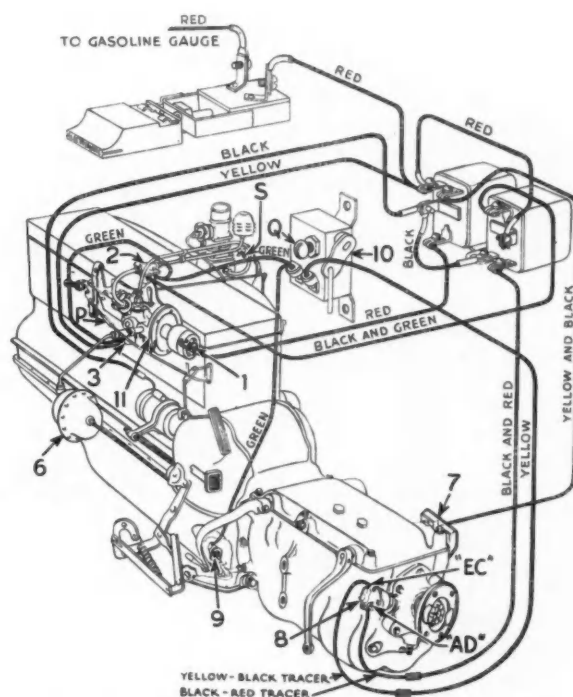


Fig. 2—Schematic drawing showing the diaphragm chamber on the side of engine crankcase.

tion, overrules all other control switches. When this switch is in the "in" position, the switch points are closed, and the direct-drive solenoid is energized, which makes the Electromatic mechanism operative. For certain conditions of operation this solenoid is de-energized by other controls.

A slower rate of clutch engagement is required when starting in low and reverse than when starting in second and high. In order to obtain two rates of clutch engagement, a low-and-reverse solenoid (1 or Sol. 1) is provided. When this is energized it pushes a plunger forward, thereby increasing the load on the clutch-control-valve diaphragm spring, lowering the rate of clutch engagement. The solenoid is energized only when the shift lever is in low or reverse. The low-and-reverse solenoid is controlled by the low-and-reverse switch, which is operated by the low-and-reverse shift rail. The contact points in the switch are closed and the low-speed-and-reverse solenoid is energized only when the shift lever is in the low or reverse position.

If only the controls so far described were provided, the clutch would be disengaged and the car would free-wheel whenever the accelerator pedal was released. To prevent this, a governor switch is provided which locks out the Electromatic mechanism at speeds above 17 m.p.h. There are two sets of contact points in the governor switch, the Electromatic clutch points marked EC and the Aero-Drive points marked AD. Below governor speed (17 m.p.h.) the EC points are closed and complete the circuit through the lock-out switch, thereby energizing the direct-drive solenoid. At the governed speed the EC points open and the AD points close. Opening the EC points breaks the circuit through the direct-drive solenoid, de-energizing it and thus cutting off vacuum from the power chamber, preventing clutch disengagement.

With the governor making the Electromatic mechanism inoperative, it would be impossible to shift gears at speeds above 17 m.p.h. without some device to overrule the governor. The direct-drive switch serves this purpose. When its switch points are closed it completes a circuit around the EC points of the governor switch, energizing the direct-drive solenoid and making the Electromatic clutch inoperative. The direct-drive

switch is mounted on a bracket in such a position that it is operated automatically by the second-and-high gear-shift lever. The switch points are open when high-gear is engaged and closed at all other times. The switch is so adjusted that the first movement of the shift lever out of the high-gear position allows the contact points to close, thus permitting clutch disengagement before the transmission lever begins to move.

The function of the accelerator switch on the forward side of the dash is to prevent excessive clutch-plate wear due to slippage when operating in high gear below governor speed—by locking out the Electromatic clutch. When the accelerator switch is opened, it interrupts the circuit through the direct-drive solenoid and renders the Electromatic clutch inoperative. The switch is so set that the contact points are closed when the accelerator pedal is fully released. As the accelerator is depressed, the contact points open when the slack in the linkage has been taken up and before the carburetor throttle starts to open. The accelerator switch is connected in series with the EC points of the governor switch and in parallel with the direct-drive switch, so that the direct-drive switch will overrule the effect of the accelerator and the EC governor switch in all gear-shift positions except direct drive.

In second gear there would be a tendency for the car to lurch unpleasantly if the clutch were permitted to engage rapidly the instant the accelerator was depressed. To ensure a smooth engagement without lurch is the function of the second-speed solenoid valve (2 or Sol. 2), which delays clutch engagement until the engine speed has been increased to correspond to the car speed. The second-speed solenoid valve is an electrically operated choke placed in the air-bleed line. When energized, it restricts the rate of air bleed to the power diaphragm chamber and so slows up the rate of clutch engagement. The choke functions only when driving in second gear above governed speed, its solenoid being de-energized and the air-bleed line fully open under all other conditions. In order that the second-speed solenoid valve will be energized only when the car is being driven above the governed speed in second gear, it is connected in series with the AD points of the governor switch and the second-speed switch.

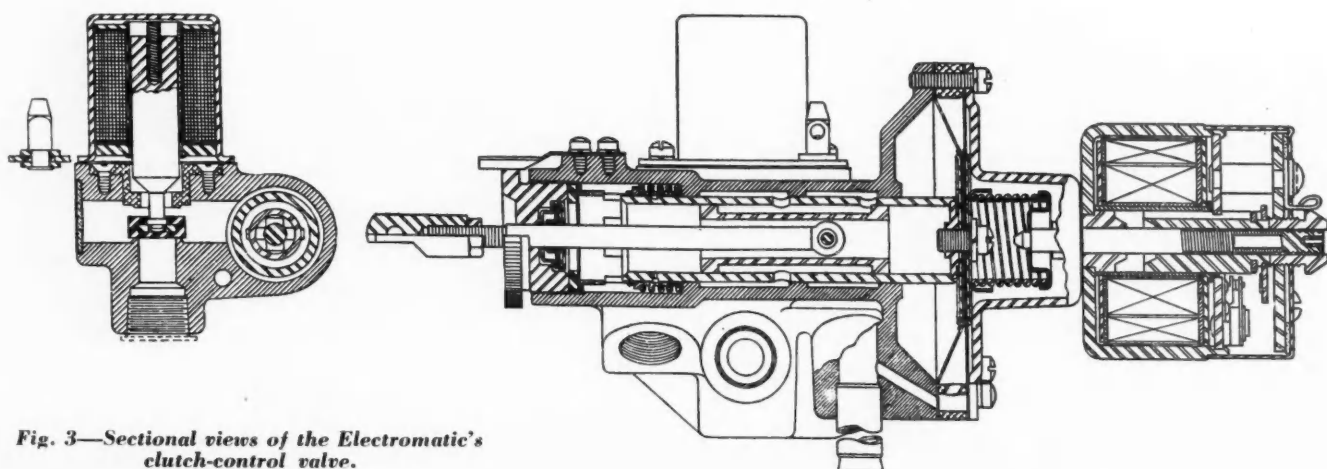


Fig. 3—Sectional views of the Electromatic's clutch-control valve.

The AD points in the governor switch control the circuit through a coil in the relay which when energized closes a set of points in the second-speed solenoid valve circuit. The AD governor switch points are closed only when the car is running at above governed speed. But current will flow through the coil in the relay only if all other switches in the circuit also are closed.

The second-speed switch, mounted on the second-and-high-gear shifter rail, is connected in series with the second-speed solenoid. This switch has only one set of points, which are closed and complete the circuit when the second-speed gears are engaged.

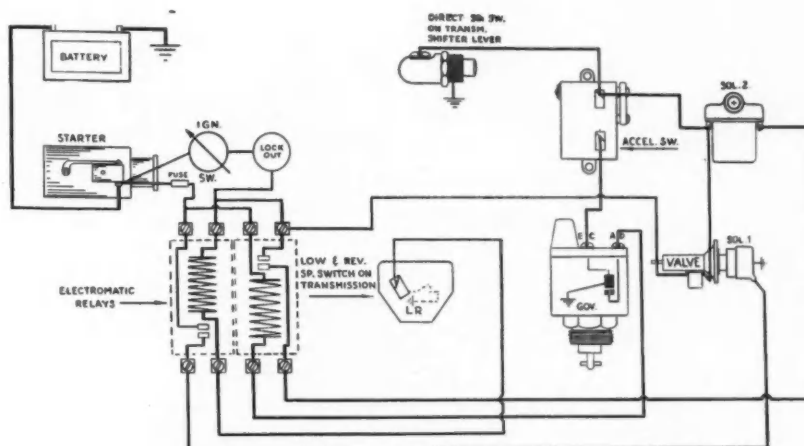


Fig. 4—Circuit diagram of the Packard Electromatic clutch.

PRODUCTION LINES

Military Gasoline

The West Coast conventions emphasized the fact that our available production facilities for making 100-octane gasoline will fall short of the needs of the flying services. Some observers feel that an immediate solution may be found in the adoption of heavier-leaded high octane fuels now in production. Evidently the transport companies have had a lot of experience with this type of fuel and have found it quite acceptable.

Metal Processing

A major contribution to the advancement of the art of metal working is found in the recent book "Metal Processing" written by Prof. O. W. Boston, director of the department of metal processing at the University of Michigan. Although the book is primarily a college text for upper classmen, it can be used for short courses and industrial courses in connection with national defense training. On the other hand, the book is so up-to-date in its treatment of metal cutting, recommended practice, and machinability that it should be of real practical value to practicing engineers and factory executives. It may be noted that this text represents a revision and a consolidation of the material which appeared originally in the two-volume set on "Engineering Shop Practice" by the same author. Generally speaking, the new book covers the gamut of machine tool types, de-

scribes current machine shop practice, gives examples of recommended practice in metal processing. In addition, it may be considered as an excellent guide to machinability, nomenclature of cutting tools, and many other references to current practice. All of this broad field has been condensed into some 630 pages of text. The book is published by John Wiley & Sons.

Magnaflux Method

It's no longer news that Magnaflux is universally employed for the inspection of stressed parts for aircraft and to a large extent in automotive establishments. But it is of interest to find that the Magnaflux method is being extended to the inspection of parts of heavy duty motor vehicles when they are torn down for overhauling. Important point is that fleetmen think that Magnaflux may serve to save many vital parts ordinarily discarded, if inspection proves that they are free from flaws. Needless to say, this would mark an important contribution to national defense these days when spare parts will be scarce.

Chromium Plating

Industrial chromium plating is finally coming into its own what with the increasing pressure of national defense. Its most important job is to salvage valuable and expensive elements of heavy duty motor vehicles. Van der Horst has launched his "porous" plate

which is suitable for the plating of engine barrels both for aircraft and heavy duty vehicle engines. United Chromium will find a fertile field in this movement. One fleet operator already has begun to plate the clutch plate and flywheel face, finds that the life of heavy duty clutches has been greatly extended thereby.

Improves Coupling

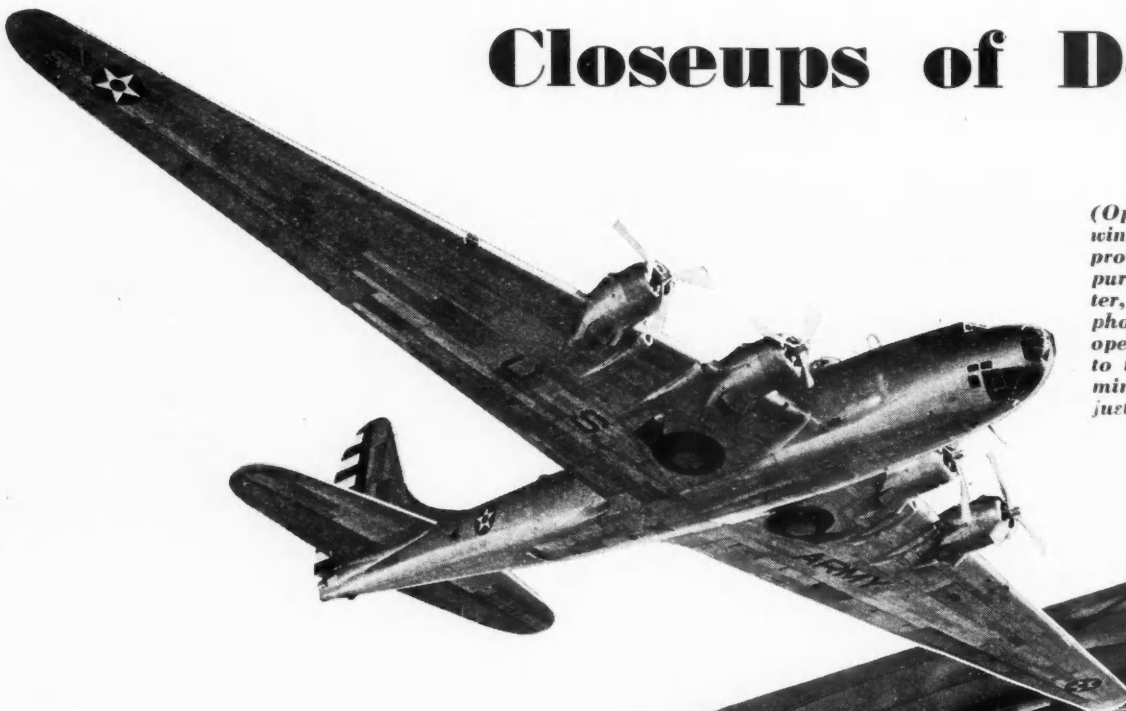
An improvement in the method of retaining cotter pins in yoke coupling devices such as are used for brake linkages, for example, has been developed by a Cleveland inventor. The device comprises a special form of lock washer used in conjunction with a retaining pin which is held in grooved ends of the washer. The lock washer is of spring type, said to banish the looseness experienced in conventional linkages, and to make it unnecessary to employ the usual coil spring accessories after the vehicle has been in service for some length of time. Although the patent papers on this device have not yet been published, the inventor will be glad to discuss it with any of our readers.

Aircraft Lubes

Continuing its unique service to the automotive industry, the September issue of *Lubrication* has devoted its entire contents to aircraft engine lubrication. The subject has been so treated as to indicate the close relation between design, maintenance, and operation with specialized aircraft engine oils. Most of the data are based upon successful lubrication experience of about one-quarter million engine hours of scheduled airline operation. The technical discussion is supplemented with a recommendation chart for fuels and lubricants for well-known aircraft engines.

(Turn to page 80, please)

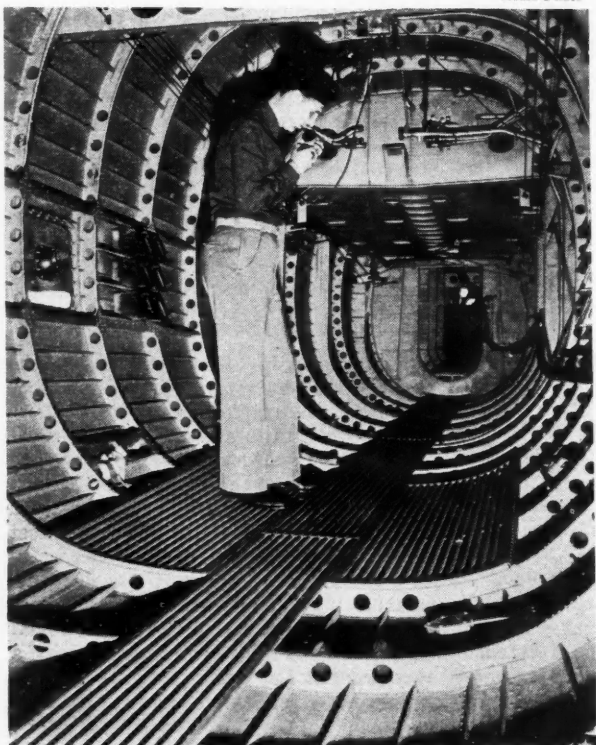
Closeups of Douglas



(Opposite) Inside the wing ample space is provided for inspection purposes. At the center, where the hand phone is hanging, the opening permits access to the engine to make minor repairs and adjustments while in the air.

(Right) Looking into the bridgehead toward (L to R) Lt. Col. Stanley Umstead, pilot; Warren Dickinson, flight engineer, and Major Howard Bunker, co-pilot. At the rear is a radio engineer.

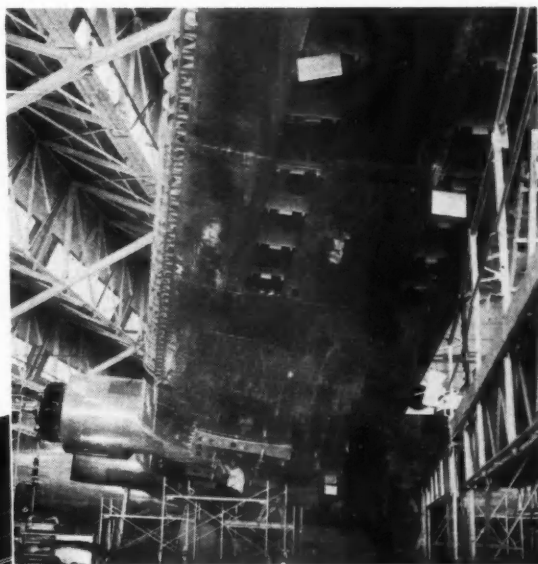
(Below) Inside the fuselage at the rear. The opening at end is the entrance to the rear machine gun turret.



FROM these photographs can be gained some idea of the vast amount of engineering and manufacturing skill that had to be crowded into five years to complete this pioneer project. Weighing 82 tons fully loaded, this Douglas B-19 Army bomber has a load capacity of 28 tons, including 18-ton bomb load or 125 fully equipped soldiers. The fuel tanks hold 11,000 gal. to feed four 2000 hp. engines. Range is 7750 miles. It is equipped with a telephone system of 24 stations and four 2-way radios. Wing spread is 212 ft. and length 132 ft. It carries a crew of 10.

B-19 Bomber

(Right) The underside of the wing in its final stages of construction.



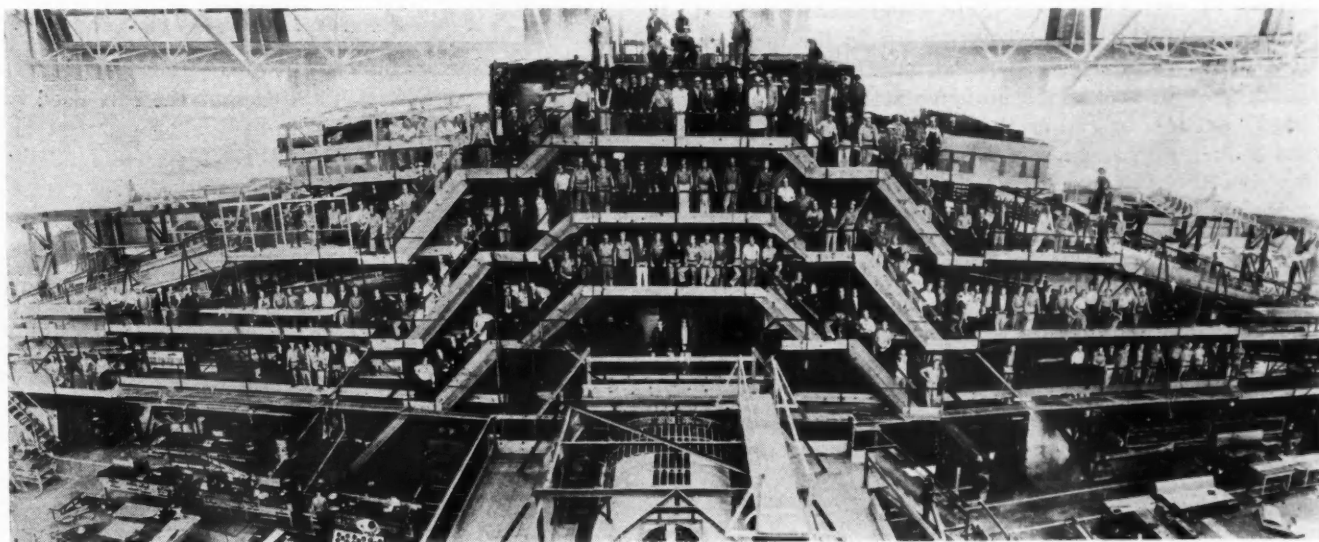
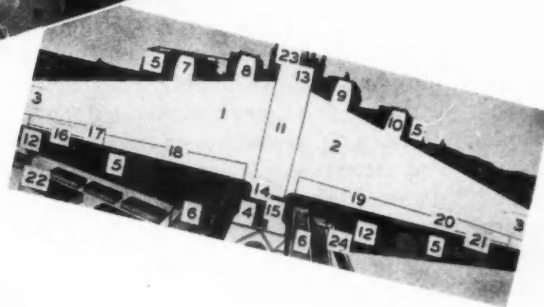
(Center) A close-up of the landing gear shock absorber. The 12-in. hydraulic piston can move 22 in. in 0.2 sec. Total travel is 58 in. in 0.9 sec. It carries 20 gal. oil and 2060 cu. in. air. It was tested at an internal bursting pressure of 251,000 psi.



A seven-story jig was required at the Douglas plant to hold the wing and center fuselage section. The big bomber was built in three separate sections.

KEY TO PHOTO AND DIAGRAM

- | | |
|--|---|
| 1.- 2. Left and right wings. | 13. Nose section, behind main jig, attaches here. |
| 3. Wing tips, built outside main jig, attach here. | 14. Rear section attaches here. |
| 4. Rear section of fuselage in separate jig. | 15. Stringers of rear section. |
| 5. Work benches at base of main jig. | 16.-21. Left and right aileron trimming tabs. |
| 6. Work platforms around tail | 17.-20. Left and right ailerons. |
| 7.- 8. Left and right outboard and inboard nacelles. | 18.-19. Left and right wing flaps. |
| 11. Center fuselage section in main jig. | 22. Work benches at base of main jigs. |
| 12. Stairway to first level. | 23. Men on top of seventh level of main jig 48 feet up. |
| | 24. Stairway to rear section. |



Optically Flat Surfaces on Mass Production Basis

AN EXTENSIVE study of the methods for obtaining optically flat surfaces on a mass production basis is said to have been completed by the Mid-West Abrasive Co., Detroit, Mich., and has yielded practical results which should be of interest to the producers of aircraft parts, other defense products requiring fine finishes, and to producers of automotive parts.

Optically flat surfaces have been used on some automotive and airplane precision parts for some time but the chief drawback to their more extensive industrial use has been the time skilled labor required to produce them. The piece to be surfaced must first be rough ground. This is a machine operation and the time required is, of course, determined by the area to be ground. The second operation is a finish grind which produces a surface that is flat and smooth within a correction of about 20 microinches, r.m.s.

The final finishing consists of a series of lapping operations which have been done largely by hand. Even when lapping machines are used the final operation is still by hand. Hand lapping is a slow and highly skilled operation. The work is rotated on cast iron lapping blocks with abrasives of varying degrees of fineness and hardness. Where fine precision is required, this hand lapping operation resolves itself into several steps, each one employing an abrasive of increasing fineness.

Experimental work with different types of abrasives was undertaken by the Mid-West organization some time ago, with a view to eliminating entirely all hand lapping operations. From their experiments it soon became apparent that the solution lay in the development of a proper bonding agent. With the bonding agents then in use, if the abrasive stone or disk was "hard" enough to retain the abrasive grains firmly, thus reducing wear and assuring that the stone would stay flat, the tendency to "load up" and stop cutting became great. If the bond fracture rate was increased sufficiently to make the stone self-cleaning, then the grits would tear away unevenly, spoiling the flatness of the stone and, consequently, of the work.

The search for a bonding agent that would allow the stone to be self-cleaning and still wear evenly led to the development of "Micro-Bond." Being of high capillarity, it completely surrounds and coats each individual grain of abrasive. With each grain completely insulated and supported, adherence of two or more grains is impossible and an even grain structure is maintained. Since the grain structure remains uni-

form, even wearing and precision flatness are assured.

Using stones made with Micro-Bond, a surface finish of 2 micro-inches (r.m.s.) is obtained in a minimum contact time directly from an 18-20 micro-inch ground finish. All hand lapping operations are eliminated with consequent saving in time and cost. Flats obtained by this method are said to have so perfect a surface that, when two are pressed together, they will adhere in a manner similar to the action of gage blocks.

In practice, the flatness of fine surfaces is checked with optical flats which are lightly slid over the surface from the side or placed directly on and tapped lightly, taking care to keep the surfaces free of foreign matter. This procedure produces alternate bands of light and dark color known as interference bands. Their pattern indicates the extent and direction of any deviation of the surface of the work from true flatness. If the bands are straight and evenly spaced, the surface is flat. If the surface should contact within about 0.000003 in. and both are accurate flats, instead of a series of bands the entire area will show a solid gray color.

The spacing between the bands represents a height difference between the two surfaces of half a wave length of the light source used. For sharp band patterns and precise readings, it is desirable to use monochromatic light such as Krypton or the mercury vapor arc. These will give corrections to 0.000012 in. while sodium vapor permits readings to 0.000006 in.

TNT Versus Gasoline

IN THE recent announcement of a new experimental aircraft engine it was stated that the fuel used is carbon disulphide and nitrous oxide "pronounced by Army experts as powerful as TNT." This undoubtedly gave the lay public the impression that the engine must be tremendously powerful. It is a fact that 1 lb. of trinitrotoluene contains only about 6500 B.t.u., as compared with about 19,000 in a pound of gasoline, so that if the thermal efficiencies were the same, about three times as much TNT as gasoline would have to be carried for a given trip. The basic fuel elements in both gasoline and TNT are the same, carbon and hydrogen, but the TNT in addition to these fuel elements carries the oxygen required for their combustion, and nitrogen to which the oxygen is bound, while gasoline contains fuel elements only and depends on the omnipresent atmospheric air for its combustion.

Creeper Track for Single Wheels

KNOwn as the Ingos Rotaped, a new form of self-laying track mechanism for vehicles with two or four driving wheels has been devised by an English firm, George Monro, Ltd., Waltham Cross, Herts, makers of small tractors. It is shown in the accompanying illustrations (made available with the following particulars of the courtesy of "Commercial Motor," London) as applied to a Fordson farm tractor, but with appropriate modifications it is also being made for trucks with two or four driving wheels, trailers and even horse-drawn vehicles.

The standard type for farm tractors and trucks consists, as shown, of six steel links of channel section, with a narrow channel formed on the inner side of each link. Across the narrow channel are pins to constitute a rack and so spaced as to engage successively with the sprocket-like driving wheel that displaces the ordinary wheel of the vehicle. The sprocket-wheel does not bottom on the cross pins, but has a flange at each side riding on the edges of

the narrow channels of each of the six steel sections.

Lying within, or in vertical alinement with, the outer part of the channel links are two chains, each arranged in the form of a triangle, with the ends fixed at one corner and passing over rollers at the other two

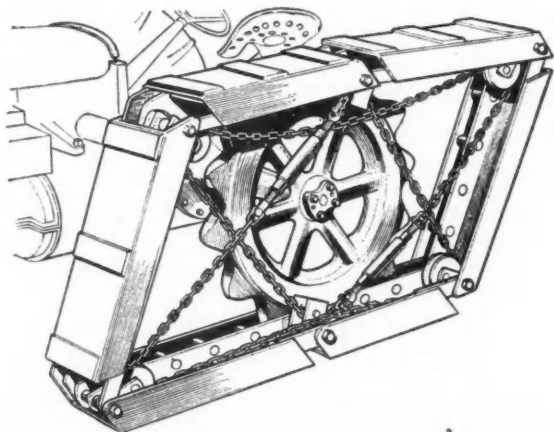
corners. The function of these chains is to assist in supporting the weight of the vehicle when the sprocket-wheel passes over the pivot joint of any pair of links. Adjacent to one end of each

This British device is applicable to existing wheeled tractors and trucks

chain and forming part of its length is an adjustable tensioner.

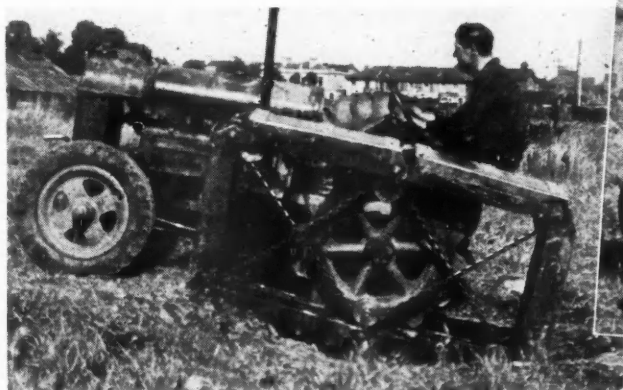
Tracing the cycle of movements of one section of the track, and taking the link seen in the drawing almost vertical in front of the sprocket-wheel, this section is lowered to the ground as the tractor advances; when it becomes horizontal the wheel passes over it and on to the next. The section is then lifted at its rear end to a vertical position, raised bodily and swung round to the horizontal above the wheel. From this stage it moves forward, tips downward and re-assumes a vertical position, so completing its orbit.

(Turn to page 88, please)



Two stages in the cycle of movements of the Rotaped creeper track as the tractor climbs from a depression in the ground are shown below. In the sketch at the left are shown details including the chain anchorage and rollers, chain tensioners and rack formed by pins across the narrow inner channel.

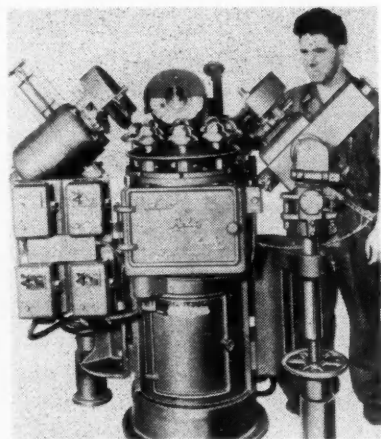
Illustrations, Courtesy of Commercial Motors, London



DESIGNED with hand feed to cross slide and a manually-operated six-position turret, the Oster No. 601 turret lathe has six 1½ in. diameter tapped holes in each turret face for mounting various sizes of tool holders. It is a new product of the Oster Mfg. Co., Cleveland, Ohio. If the hexagon turret is not required, the machine is furnished with a plain saddle on which a variety of tool posts or other fixtures can be mounted.

Among the many operations performed by the machine are boring, reaming, threading, facing, and cutting off. Automatic chuck capacity is 1½ in. round bar, 1 1/16 in. square bar, and 1 5/16 in. hex. bar. Swing over bed is 14 in. and over cross slide 6½ in. The carriage travel is 11 in. when there is a cross slide on the 33 in. main ways. Maximum movement of the screw feed cross slide is 6½ in. and of lever feed cross slide 4½ in. Either worm drive or direct drive is optional, depending upon the required range of spindle speed.

FOR special polishing and buffing jobs on defense contracts, Hammond Machinery Builders, Inc., Kalamazoo, Mich., has developed a rotary automatic polishing machine capable of handling a wide variety of circular pieces such as aluminum pistons for aircraft engines, fuse bodies, the ogive



For special polishing and buffing operations on circular parts, Hammond Machinery Builders designed this automatic machine

and bourrelet of 37 mm. shells, and the soldered joint of 75 mm. shell windshields.

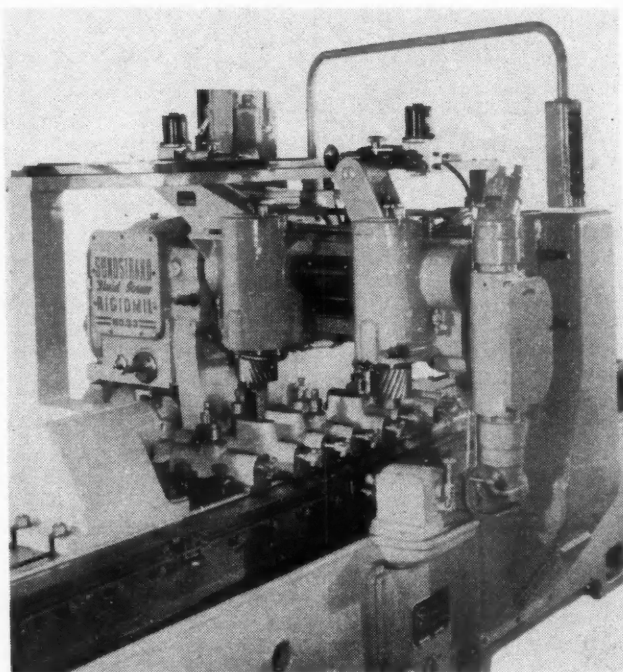
This machine, which is known as Model J, consists of a circular aluminum table, which indexes automatically, rotating 6 to 8 chucks that pass under as many as four polishing heads mounted in pedestals, which stand on the floor around the machine. Polishing heads are independently driven, either by V-

belts from motor on base or direct from motor on spindle. Buffing wheels are adjustable and composition is applied to them automatically by air pressure with the Hammond Autodoper, an accessory attachment. By substituting chucks, the machine will polish or buff small flats.

ANEW machine for milling the edges of propeller blades was completed recently by the Sundstrand Machine Tool Co., Rockford, Ill. It is built around the Fluid-Screw Rigidmil type of feed unit, in which the table is actuated by screw controlled by a hydraulic transmission. The 90-in. power feed has a feed range of ½ to 38 in. per minute (or rapid traverse of 300 in. per minute).

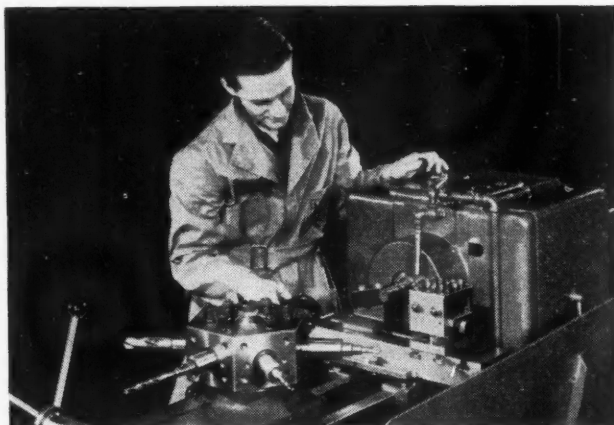
In order to mill both sides of the blade at the same time, the machine is provided with two vertical type spindle heads

which are mounted on a cross rail. Movement of each head along the cross rail is controlled by a screw driven by a fluid motor which, in turn, is controlled by a hydraulic duplicator attachment. The part is held on the machine table between a headstock and footstock member and is supported at intermittent points by jacks. Using spiral milling cutters, spindles are arranged to rotate so that the cutting thrust is down against the jacks. The entire milling cycle is automatic, including the stopping of the table at the end of the rapid return stroke.



Sundstrand propeller edge milling machine

MEN and



Oster No. 601 Turret Lathe

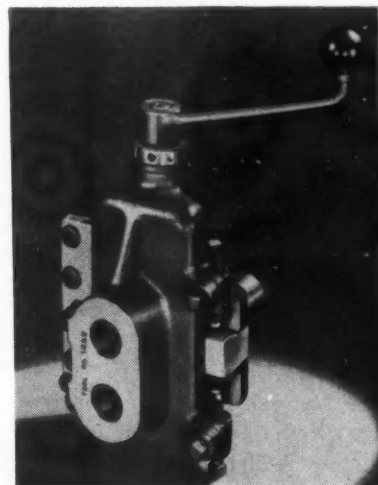
MACHINES

AT DETROIT, MICH., the Udylite Corp. has developed an automatic parkerizing machine capable of processing large quantities of small parts that should interest manufacturers who have large contracts involving the production of .30 and .50-cal. machine gun steel links, Garand rifle clips and miscellaneous machine gun parts requiring the Parker finish.

The machine is a hopper type unit air or hydraulically driven according to the desires of the customer. The parts are loaded in batches at one end and progressively transferred through

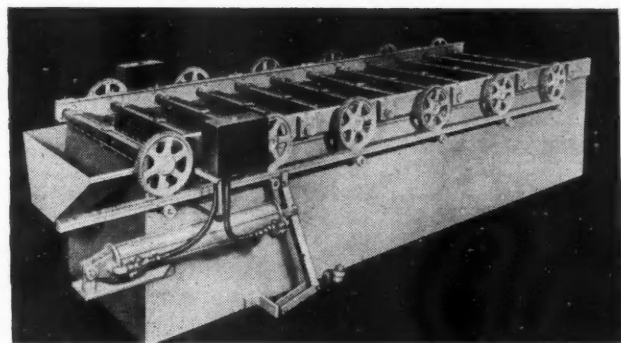
ANEW rapid slide tool for turret lathes recently announced by the Gisholt Machine Co., Madison, Wis., is designed to hold small boring bars and forged cutters. Movement of the lever transmits a rapid, smooth motion to the slide, thus permitting back-spacing and recessing operations to be performed quickly. Adjustable stops are provided for quick setting, permitting duplicate work.

TO MEET the heavy duty sanding, rubbing and polishing service in defense industries, the Detroit Surface



Gisholt's new rapid slide tool for turret lathes

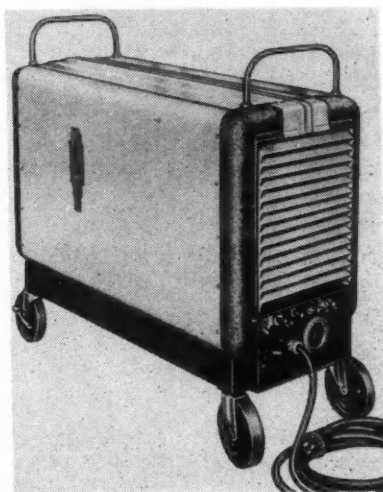
crease the flow of air through the motor. These machines are available with either 110 or 220 volt motors.



Udylite automatic parkerizing machine for small parts

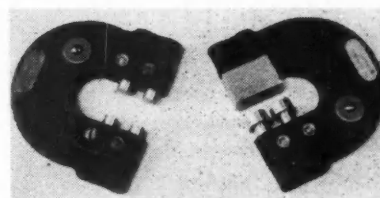
the various dipping tanks required for the Parker process. The machine is fully automatic. No manual handling whatever is required for the complete parkerizing cycle including cleaning, rinsing, parkerizing, baking and oiling. Each batch remains a separate unit throughout the entire cycle and one load cannot be mixed with another. The machine is completely hooded to conserve heat.

BENWOOD LINZE CO., St. Louis, Mo., has added to its line an all-purpose power rectifier that provides a flexible source of D.C. current supply for testing various types of aircraft and D.C. motors used in such operations as testing flaps and retracting landing gear on airplanes. They also can be used within the aircraft plant or on the runway and aprons for airplane engine starting where the voltage requirement does not exceed 12 volts at 300 amperes or 24 volts at 150 amperes. This B-L unit is designed to operate on 190 to 250-volt, 60-cycle, three-phase A.C. input. It is equipped with a 16-in. diameter cooling fan. Similar units with higher voltages and amperages for specific requirements are also available.



B-L portable power rectifier for aircraft uses

Machine Co., Detroit, Mich., has placed on the market another Easy Sander, Model XL Easy, which embodies a number of improvements, as reduced vibration, an interchangeable front handle that can be shifted from front to side position, and an improved fan to in-



Model A (left) and Model C (right) adjustable limit snap gages in George Scherr Co. line

GEORGE SCHERR CO., New York City, has placed on the market its own line of adjustable limit snap gages under the trade name Atlantic. These
(Turn to page 84, please)



Model XL Easy reciprocating electric sander

WHAT THE INDUSTRY IS DOING

[Our own view of automotive production and sales;
authoritative interpretation of general conditions]

AUTOMOBILE production in November marks the beginning of a downward trend that probably will see less and less output each month until the ebb point is reached next summer under the passenger car quotas worked out by OPM. The November total is estimated at 373,000 motor cars and trucks, a decrease of 27 per cent from the 510,973 vehicles that were turned out in November, 1940, which stands as the record for the month. November's output is the second lowest for the month in the last seven years, the only smaller total in that period being November, 1939, when the Chrysler strike cut the total to 368,541 units.

November, with four less working days than October, registered a 6 per cent drop from October's production total. December will see another decline, with output reduced to 204,848 passenger cars, 22,000 light trucks and an undetermined number of medium and heavy trucks. February passenger car quotas as announced by OPM restrict passenger car output to 174,122 units, a reduction of 56.1 per cent from February, 1941.

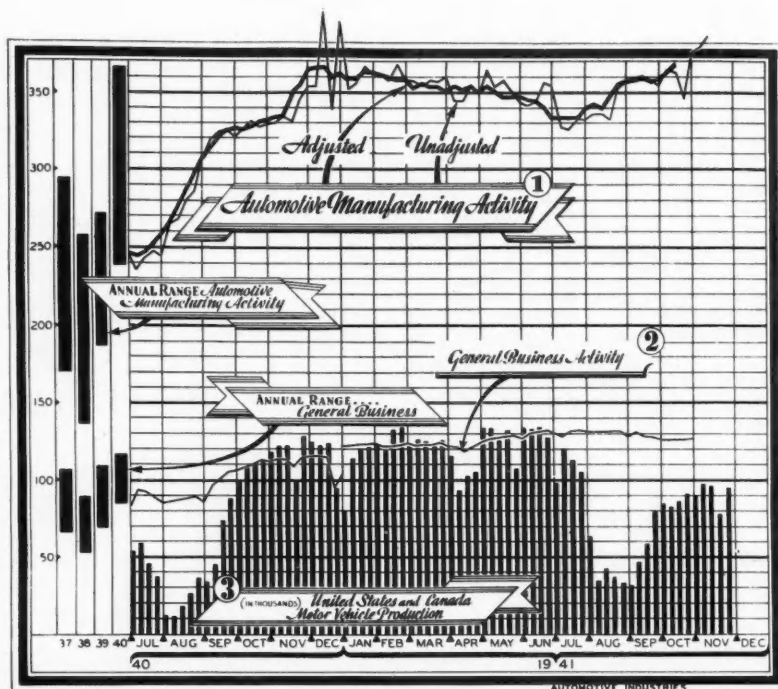
Truck production for the 1942 model year is estimated at 800,000 for civilian use and 329,000 for military and Lend-Lease purposes. However, material shortages are likely to curtail civilian production by 75,000 units. Passenger car output over the same period is set at 2,146,000 vehicles. Although farmers claim that light truck output limitations may result in a shortage of rolling stock, the OPM has shown no inclination to relax restrictions which set January and February quotas each at 7 per cent of the average

annual production in the base period from August, 1938, through July, 1941. However, manufacturers may use up their passenger car allotments in light trucks if they choose.

Production in the industry for the week ending Nov. 22 was estimated at 78,000 units as the Thanksgiving holiday in most states reduced operations. General Motors produced 34,400 units on a four-day basis while Chrysler divisions ran only three days and assembled 9800 vehicles. Ford made 19,500 on a four-day basis.

Studebaker topped the independents, followed by Willys, Nash, Packard and Hudson. Production was expected to rise close to the 100,000 mark for the last week of November as manufacturers attempted to meet their quotas under the Nov. 30 deadline. However, companies which fail to produce their full quotas due to material shortages or labor troubles, may be permitted to carry that production over into December.

October retail passenger car sales totaled 184,561 units, according to the Automobile Manufacturers Association, a drop of 43 per cent from the same month of 1940, and the lowest for the month since 1938. However, it marked a seasonal rise of 65 per cent over September deliveries despite doubling of the Federal excise tax to 7 per cent Oct. 1. Commercial vehicle retail sales in October totaled 59,376 units, an 11 per cent increase over October, 1940, but the smallest truck sales for any month since November, 1940. This reflects the curtailment in light truck output. New passenger car registrations in 16 states for October showed 42 per cent decline from October, 1940, indicating total registrations of 162,000 units for the month, according to R. L. Polk & Co. New truck registrations were down 14 per cent from a year ago. Studebaker consumer sales for October dropped 52 per cent.



Weekly Indexes of Automotive General Business

November Production Estimated at 373,000

¹ 1923 average = 100; ² Prepared by Administrative and Research Corp. of New York to Jan. 1, 1941, and *New York Times* weekly business index after that date; ³ Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

New Estimates Required of Defense Metal Stocks

Stepped-Up Production and Exposed Supply Routes Threaten Stockpiles; Allocations in Abstract Stage

By W. C. Hirsch

Allocation of steel is still largely in what a Washington correspondent aptly calls the "think" stage. The switch from the prevailing priority system is expected to come gradually and piecemeal, with those consuming industries, in which visibility of essential requirements is better than in others, serving as testing ground. The correlation of defense needs estimates with what civilian industries think they should have is becoming an increasingly difficult task, acting as a brake on too ambitious hopes for allocation as an early solution of the steel distribution problem.

Although preference ratings here and there come in for left-handed bouquets from this or that disgruntled steel consumer, it is significant that manufacturers with defense contracts as well as a backlog of civilian business on their books have relatively few complaints to make, presumably because they are brought face to face daily with both sides of the picture. Freezing of drop forging prices on the basis of Oct. 10 levels by the Office of Price Administration allayed fears that, while quotations for primary forms of steel were being held in check, prices for some steel products might get out of hand.

Apprehension by the Army and Navy that a shooting war in the Pacific might seriously impair the movement of a number of strategically important metals to this country is said to have resulted in a revision of previous estimates of requirements and a rechecking of stockpiles. Extension of the zone of naval hostilities would almost immediately be felt in diminished receipts of chromium, much of which comes from countries dependent on Pacific Ocean transportation for shipping to the United States. There is also much anxiety over the future of manganese receipts from the Gold Coast and Russia, the two most prominent suppliers of this mineral "starch" by which carbon steel is toughened into armor plate.

In magnesium, which has been under priority control since March, the shortage has become so acute that the Office of Production Management has ordered a complete report on all supplies "in whatever form or by whomever held." The metal is urgently needed in the

manufacture of airplanes and the making of incendiary bombs. A good deal of magnesium is thought to be in the form of scrap or semi-finished products in warehouses, and it is these accumulations that OPM is after to tide the defense program over until the middle of next year when plants now in course of construction are expected to add 400 million lb. annually to the present inadequate 100 million lb. output. Construction of additional aluminum fabricating plants with government cooperation is getting under way.

Stepping up in October of copper output by Chile, Peru and Mexico to record-breaking production figures, gratifying as it is, can hardly be depended upon to continue and no marked alleviation in the tight supply situation is expected until additional facilities in Arizona get into production.

A-3 Rating Recommended For Replacement Parts

Country-wide investigation of shortages in automotive replacement parts, to be made by its 16 regional committees, was authorized by the Central Motor Transportation Committee at a meeting in Washington on Nov. 19.

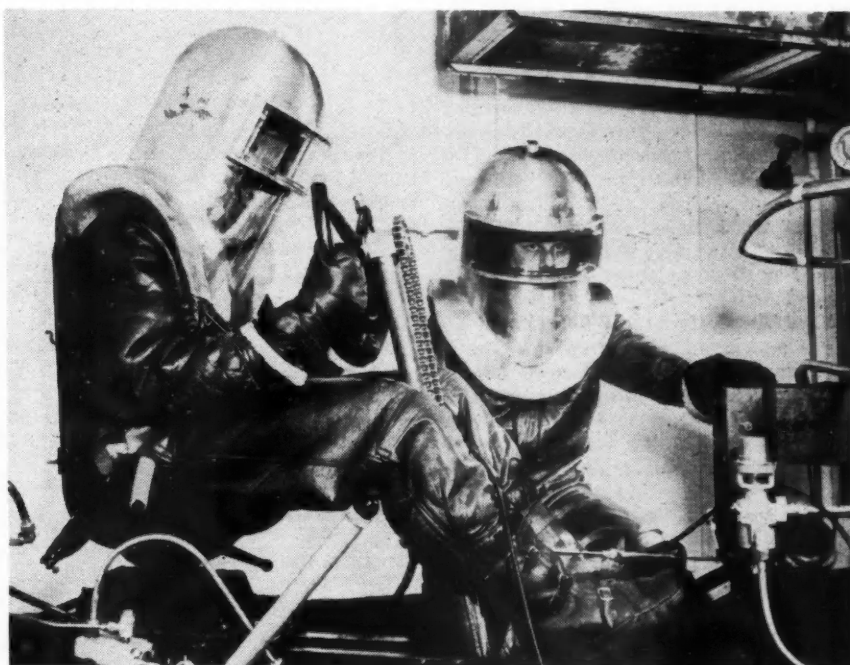
The Committee also adopted a resolution recommending to OPM that the present A-10 rating on motor vehicle replacement parts applying to private and for hire operators be raised to A-3.

The investigations are to be published monthly and are designed to establish trends in shortages of replacement parts so that cumulative reports may be used to indicate the needs of parts to operate existing transports.

The resolution proposing that the rating on replacement parts be raised to A-3 would do away with the distinction made in OPM's P-22 order between private and for hire operators and those working on defense.

NADA Moves to Washington

The National Automobile Dealers Assoc. has moved its offices from Detroit to new headquarters at 1026 17th St., N. W., Wash., D. C.



Wide World

Scientific Ice Box

Not a couple of men from Mars but two researchers helmeted like undersea divers and wearing sheepskins studying how airplanes will perform 10 miles above the earth. The research is being carried on in the new "cold room" operated by the Douglas Aircraft Co. The temperature of

the room runs as low as 67 deg. below zero. The hose line at the waist of the pilot at the wheel is for breathing. The men are studying the effect of cold on rubber hose connections and lubricating oil at 40,000 ft. temperatures where it's usually 40 deg. below.



British Combine

Matilda Ready for Battle

This closeup shows the gun turret and armament of one of Britain's newer "tools of war", the Matilda tank, which is equipped ready for action.

Improved Bearing Inspection Process

Perfection of a new process for inspection of bonded bearings that will aid in preventing some of the occasional inexplicable airplane failures has been announced by F. C. Kroeger, vice-president of General Motors.

Rubber Consumption Up

October consumption of crude rubber by domestic rubber manufacturers was 60,418 long tons according to statistics released by the Rubber Mfrs. Assoc., Inc. Consumption during October was 12.6 per cent above September and was 1.3 per cent above October a year ago.

Gross imports for October totaled 72,222 long tons. This represents a decrease of 13.1 per cent under September and is 3.3 per cent under October, 1940.

Total domestic stocks at the end of October, including Government reserves totaled 454,711 long tons. This is 4 per cent under Sept. 30 stocks, but is 93.20 per cent over the stocks estimated for Oct. 31, 1940.

Truck Producers Promised Additional Army Orders

Present Army Contracts Near Completion; OPM Puts 1942 Military Truck Requirements at 389,000

Stepping-up of War Department truck orders so that there will be no lapse in continuous production next spring was promised by Sidney Hillman, associate director of OPM, on a recent visit to Detroit. Orders now being filled for army trucks by the major truck manufacturers will run out some time between February and mid-April and there would be a period of enforced shutdowns unless more orders are placed. Hillman promised an order of more than \$200 million for 94,000 trucks, presumably for U. S. military needs, and another \$230 million order for 123,000 vehicles, probably for Lend-Lease use and likely shipment to Russia, China or the British in Africa and the Near East.

Truck manufacturers must have approximately five months' advance notice on orders so that subcontracts can be placed with other companies and the necessary constant flow of materials from suppliers can be assured when deliveries are scheduled. One of the largest army truck makers pays out 75 per cent of its government orders to subcontractors and suppliers.

The army truck orders which Hillman promised the industry would not alleviate the impending labor dislocation created by passenger car curtailment but they would extend the employment and truck production in the plants that now are furnishing most of the army's motor vehicle needs.

President Roosevelt's latest demand for an additional seven billion dollar national defense appropriation includes an \$800 million item for the Quartermaster Corps, which presumably would

include the new truck orders. Military truck needs for 1942 total 389,000.

(Turn to page 72, please)

FEBRUARY PASSENGER CAR ALLOTMENTS

(Non-Military Use)

	Allotments February, 1942	Percentage Decrease in Allotments January, 1942	Allotment First 7 Months 1942 Model Year	Percentage Decrease in Allotments First 7 Months Production in 1942 Model Year
GENERAL MOTORS COMPANY				
Chevrolet.....	38,388†	60.1	309,257*	41.2
Buick.....	13,943†	58.6	112,272*	46.2
Pontiac.....	12,216†	59.8	98,280*	43.8
Oldsmobile.....	9,975†	53.3	80,449*	43.5
Cadillac.....	2,456†	62.3	19,673*	40.5
Total General Motors Corp.....	76,982	59.1	619,931	42.9
CHRYSLER CORPORATION				
Plymouth.....	21,406	57.1	172,386	45.6
Dodge.....	10,084	60.5	81,204	38.6
Chrysler.....	5,124	68.4	41,261	49.3
De Soto.....	3,587	59.1	28,721	44.0
Total Chrysler Corporation.....	40,181	59.9	323,572	44.4
FORD MOTOR COMPANY				
Ford.....	27,461	59.1	221,138	38.2
Mercury.....	3,762	59.4	30,296	41.5
Lincoln-Zephyr.....	1,085	54.5	8,737	39.0
Total Ford Motor Company.....	32,308	59.0	260,171	38.6
Total General Motors, Chrysler and Ford.....	149,471	59.3	1,203,674	42.4
OTHER MOTOR COMPANIES				
Studebaker.....	7,509	21.6	60,466	18.3
Hudson.....	5,505	15.1	44,331	25.3
Nash.....	4,675	41.1	37,647	17.8
Packard.....	4,905	+21.0	39,503	5.1
Willys-Overland.....	1,652	+39.1	13,306	+6.6
Crosley.....	405		3,250	+1380.9
Total Other Companies.....	24,651	15.7	198,513	15.0
Grand Total.....	174,122	56.1	1,402,187	39.7

† The usual percentage distribution of passenger cars for General Motors (Option "B") has been adjusted with the following changes in numbers of cars: Chevrolet, —15, Buick, +1, Pontiac, +12, Oldsmobile, —11, Cadillac, +13. This adjustment was necessary in order to offset errors in 4 months quotas as announced in Limitation Order L-2.

* Seven months totals for each company in General Motors is equal to the sum of the four months quotas announced in Limitation order L-2 plus quotas announced for December, January and February.

7 REASONS WHY TELEGAGES ARE MORE *Accurate* AND *Durable*

The following are some of the reasons why King-Seeley Telegages have steadily increased in accuracy, reliability and durability:

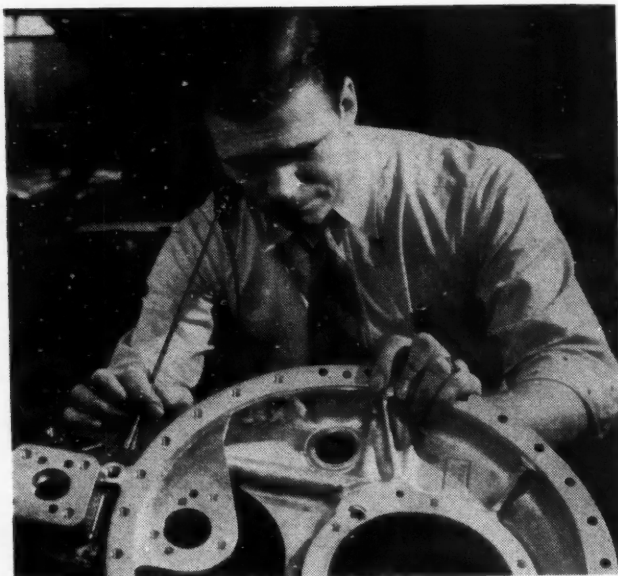
- ➡ 1 Designed to perform consistently, even though variations in the electrical circuit range from 4 to 9 volts.
- ➡ 2 Built to withstand eight hours of continuous vibration in two planes with the testing machine ranging from 0 to 6000 R.P.M.
- ➡ 3 Oil plug diaphragm metal especially constituted to withstand 10,000,000 stress reversals under loads varying through the full pressure range.
- ➡ 4 Entire assembly built to function over a temperature range of -10° F. to 125° F. with an over-all loss in accuracy of not more than 4%.
- ➡ 5 Adoption of spun glass heater wire insulation as insurance against damage from temporary "shorts".
- ➡ 6 Metal floats chosen in order to maintain initial buoyancy indefinitely.
- ➡ 7 Corrosion-free metal selected for tank arm and bearings to eliminate any tendency to stick.



**KING-SEELEY
CORPORATION**
ANN ARBOR MICHIGAN
SUPPLIERS OF ORIGINAL AUTOMOTIVE
EQUIPMENT SINCE 1922

**KING-SEELEY TELEGAGES
SHOW FUEL LEVEL,
OIL PRESSURE AND
WATER TEMPERATURE**
Transmission is entirely by Wire—No Tubes

OTHER PRODUCTS
INSTRUMENT PANELS • SPEEDOMETERS • GOVERNORS



Inspecting Tiny Holes

A new instrument similar to the bronchoscope of the medical profession, the bore-scope is used by Cadillac inspectors for examination of tiny borings and oil connections in Allison aircraft engine reduction gears. Located at its tip is a light bulb of .01 in. diameter and an equally small mirror. A microscopic sight reveals burrs or other irregularities.

Parts Standards Approved at Annual NASC Meeting

**15 Recommendations Accepted; Parts Simplification
Also Studied; Cramer Is Elected National Chairman**

General business affairs of the National Aircraft Standards Committee hereafter will be cleared through the office of Jack T. Gray, manager of the technical department of the Aeronautical Chamber of Commerce, at Washington, it was decided at the second annual meeting of the NASC, held in New York, last month.

During the meeting consideration was given to some 40 items on the agenda of NASC standards, of which 15 were approved. Among these was a general statement defining the functions of hydraulic control systems, giving general specifications. With this was coupled a color standard for hydraulic fluid. Approval was also secured for standards on universal joints (controls), recessed head screws, and fuel tank straps, while several items were added to the list of anti-friction bearing sizes.

Among standards proposals still in the work stage are extruded shapes, color identification for materials and tapped holes and mating studs.

Other projects completed or partially completed, include: Screw products, rivets (the standard calls for a 100 deg. countersink and an alternative of 78 deg. instead of the six angles originally used), electrical conduits and junction boxes, hydraulic parts, with particular attention to sizes and spacing of bolt mounting holes, threaded inlets and outlets and the position of control handles; close tolerance bolts where precision fits are required—as in wing spar splices and attachment fittings—reamed hole sizes and pilot's control wheel.

Considerable headway has been made by the Committee along the line of sim-

plification, such as reducing the number of sizes and specified thickness of sheets and plates, bar and tubing sizes in chrome-molybdenum, corrosion resistant, aluminum and aluminum alloys. The list of 27 sheet sizes was cut to 13; 140 sizes of bar stock were cut to 72.

John Cramer, Boeing Aircraft Corp., Seattle, was elected national chairman of the executive board, at the New York meeting, succeeding William M. Smith, of Bell Aircraft Corp. Other members of the Committee elected to the Board are:

Jack T. Thompson, Glenn L. Martin Co., chairman, Eastern Division; Carel Torresen, North American Aviation, Inc., chairman, Western Division; Commander R. D. MacCart, chief engineer Brewster Aeronautical Co.; and Newton Houston, North American Aviation, Inc. Messrs. Thompson and Houston succeed themselves. Mr. Gray, representing the ACC, is an ex-officio member of the board.



R. B. Cave, formerly assistant sales manager of the Merchandising Division of The Electric Auto-Lite Co., has been appointed general sales manager of the Pennsylvania Rubber Co.

James G. Ellis, formerly staff correspondent in Washington for Chilton publications, has joined the staff of the Automobile Manufacturers Assn., Motor Truck Division.

C. M. Kaltwasser has been appointed vice-president and general manager of Fleetwings, Inc. He was formerly head of

Stinson Aircraft Division of Vultee Aircraft, Inc.

David R. Osborne, director of sales training of Studebaker Corp., has been elected vice-president of the National Society of Sales Training Executives.

C. L. (Kelly) Johnson, chief research engineer of Lockheed Aircraft Corp., was awarded the Wright Brothers annual medal for 1940 by the Society of Automotive Engineers. The award was won by Mr. Johnson for his paper, "Rudder Control on Four Engine Airplanes," presented at the 1940 meeting of the S.A.E.

E. A. Berry has been appointed plant superintendent of the new Aviation Hydraulic Division of Chicago Pneumatic Tool Co. at Garfield, N. J. He has resigned as works manager of the Wissahickon Tool Works of the Empire Ordnance Corp., Philadelphia.

James C. De Haven has been named to the technical staff at Battelle Memorial Institute where he has been assigned to the division of foundry research. He was associated with the American Radiator and Standard Sanitary Corp. of Pittsburgh for the past six years.

John W. Thomas, president of Firestone Tire & Rubber Co., has been elevated to board chairman, a position that has been vacant since the death of Harvey S. Firestone in 1938. Harvey S. Firestone, Jr., son of the company founder, has been promoted from vice-president to president. Lee R. Jackson, vice-president in charge of sales, has been named to the newly created position of executive vice-president and John J. Shea, treasurer, has been made vice-president and treasurer. H. D. Tompkins, formerly Jackson's assistant, has been named vice-president in charge of sales.

Daniel A. Kimball, Pacific Coast district manager for General Tire & Rubber Co., has been named head of the company's newly opened Washington office to coordinate national defense activities. He will be assisted by V. H. Orr as engineering consultant.

Thomas D. Hogg, formerly shop superintendent of Chandler-Evans, Inc., Meriden, Conn., has been promoted to factory manager.

H. H. Budds, formerly general manager of Briggs Aviation Corp., has joined the Ranger Aircraft Engine Corp.

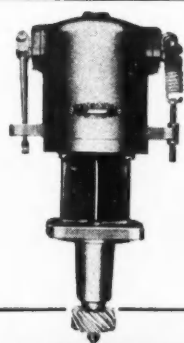
Cliff Bendle, sales engineer with Croball, Inc., since its establishment, has been appointed sales manager.

Norman E. Donnelly has been appointed marine sales manager of The Buda Co., succeeding Frank Flick. He was formerly Eastern engine sales manager of Caterpillar Tractor Co.

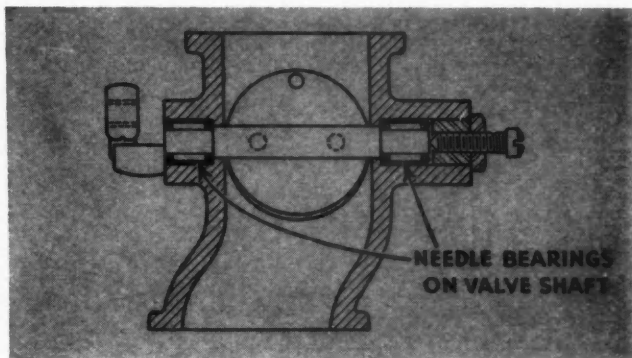
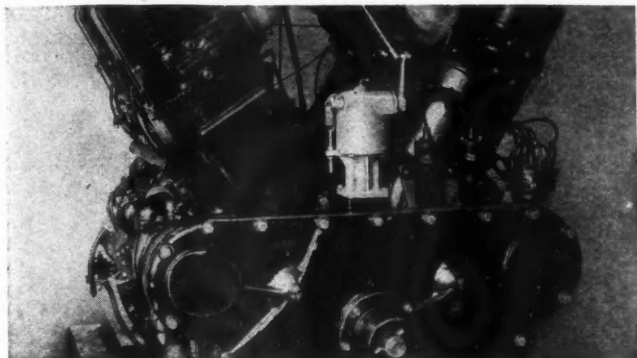
Harry Wilson, Jr., works manager of the Jessop Steel Co., was made vice-president in charge of operations.

Buick Motor Division has made the following changes in its executive personnel to meet the growing requirements of the national defense program: O. W. Young, formerly general manufacturing manager, becomes executive assistant to President Harlow W. Curtice, in charge of all manufacturing, to coordinate Buick's automotive and defense activities; W. M. Larke, formerly general superintendent, becomes manager of manufacturing in charge of Flint operations; B. H. Newell, formerly assistant general superintendent, becomes general superintendent in charge of automobile production; A. R. Middleton, formerly sheet metal superintendent, becomes assistant general superintendent in charge of automobile production; James R. Langford, formerly night superintendent, becomes sheet metal superintendent; Fred Letts, in charge of aviation manufacturing operations in Flint, becomes general superintendent in charge of all Buick's Flint defense work, both on aircraft engines and tanks; Fred W. Moore, former superintendent of tool manufacturing, becomes assistant general superintendent of defense operations; Norman Harvey, former assistant, becomes superintendent of tool manufacturing; Fred Pyper, master mechanic, be-

(Turn to page 56, please)



TORRINGTON NEEDLE BEARINGS SIMPLIFY DESIGN, REDUCE FRICTION FOR PIERCE GOVERNOR



"TORRINGTON NEEDLE BEARINGS ARE 'BLITZING' FRICTION LAG in many Pierce Governors where the critical demands of defense needs require friction-free operation," says Maynard L. Heacox, of the Pierce Governor Company. Pierce Governors are being used today to control power for defense in tanks, trucks, search-lights, field radio apparatus and in many other important applications such as that shown above on a LeRoi gasoline engine.

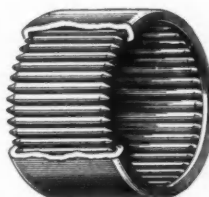
LOW INITIAL COST, EASY INSTALLATION and efficient lubrication are three of the many advantages obtained by Pierce Governor through the use of Needle Bearings on valve and rocker shafts. The precision-ground rollers and hardened outer race of these bearings form a self-contained unit that is speedily, inexpensively installed. And maintenance cost is low because lubricant is retained by the turned-in lips of the race.



"TO MEET RIGID WEIGHT AND SPACE LIMITATIONS, Torrington Needle Bearings are also used on the flyball weight pivots of Pierce Governors," adds Mr. Heacox. Here these compact bearings occupy no more space than ordinary bushings, yet substantially reduce oscillation friction.

FAVORABLE WEIGHT DISTRIBUTION, too, makes Needle Bearings ideal for weight pivot work, according to Mr. Heacox. The many linear inches of contact made possible by this bearing's numerous rollers provide an exceptionally high radial load capacity in proportion to its size.

Perhaps a small, lightweight, anti-friction bearing can give *your* product valuable advantages. Remember that Torrington Needle Bearings take no more space than bushings, yet provide exceptionally high load capacity with a minimum of wear and attention. Write for Catalog No. 107 and



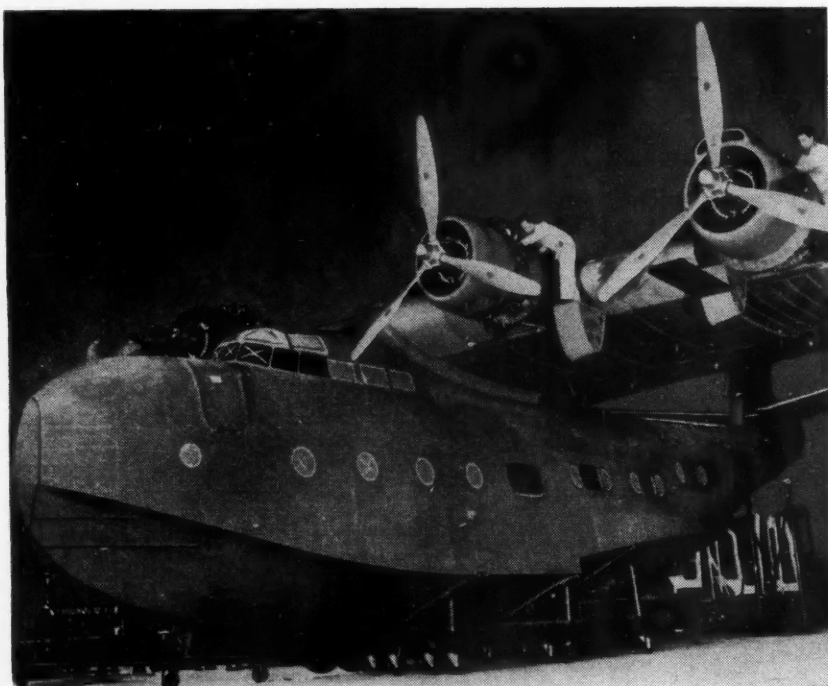
find out the complete details about this compact, low-cost bearing. Our Engineering Department will be glad to answer any questions. For information on Needle Bearings to be used in heavier service, write our associate, Bantam Bearings Corporation, South Bend, Indiana, for Booklet 104X.

THE TORRINGTON COMPANY, TORRINGTON, CONN., U. S. A. • ESTABLISHED 1866

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit Cleveland Chicago Los Angeles London, England

TORRINGTON NEEDLE BEARING



International

Another Air Leviathan

Having a maximum non-stop range in excess of 6000 miles, the first of a fleet of giant 80-ft. long flying ships for the American Export Airlines' transatlantic service will be launched in December at the Stratford, Conn., plant of the Vought-Sikorsky division, United Aircraft Corp. Two sister ships also are being rushed to completion. The top speed is 235 mph. Non-stop to Europe, they can take care of 16 passengers, including sleeping accommodations, in addition to the crew and express payload. For military use, 45 fully armed men could be transported 3000 miles at a cruising speed of 200 mph.

MEN

(Continued from page 54)

comes general master mechanic; **Homer Schultz**, former assistant, becomes master mechanic of all Flint operations; **John A. Holik**, formerly assistant superintendent of the axle plant, becomes superintendent of tank manufacture, and **Frank A. Henny**, former axle division general foreman, becomes assistant superintendent of tank production.

Thompson Aircraft Products Co., a subsidiary of Thompson Products, Inc., has opened a new \$11,000,000 plant for the manufacture of aircraft valves, fuel pumps and other parts at Euclid, Ohio. Officers of the new subsidiary are **L. M. Clegg**, executive vice-president; **A. T. Colwell**, vice-president; **J. D. Wright**, secretary-treasurer, vice-president and general manager. Operating heads of the new company are **E. A. McBride**, plant manager; **P. B. Lerch**, general superintendent; **E. F. Gibian**, chief engineer; **J. G. Moore**, production manager; **S. R. Black**, personnel manager, and **G. N. Hackett**, purchasing agent.

W. H. Doerfner, formerly general manager of the Saginaw Malleable Iron Division of General Motors Corp., has been appointed general manager of the Saginaw Steering Gear Division. He succeeds **Alva W. Phelps**, who has been appointed assistant general manager of the Electro-Motive Corp., LaGrange, Ill. **James H. Smith**, formerly works manager of the Saginaw Malleable Iron Division, becomes general manager, while **Samuel W. Haley**, assistant works manager, succeeds Smith as works manager. **French Bassett**, sales manager of the Saginaw Malleable Iron Division, has been given added duties as the division's defense program coordinator.

Earl D. Bottom has been named assistant sales manager in charge of advertising for Ford Motor Co., succeeding **A. Roy**

Barbier, resigned. Bottom has been assistant sales manager in charge of Lincoln and Mercury sales for the past six months and previous to that was branch manager at Atlanta, Ga.

David E. Ralston, formerly general sales manager, has been named manager of Oldsmobile's automotive operations. **H. A. Trevellyan**, assistant general sales manager, succeeds Ralston as general sales manager. Trevellyan will be assisted by **G. R. Browder** and **G. H. Lemons**. **R. E. Griffin**, manager of Oldsmobile's defense operations, will be assisted by **R. L. Myers**, former assistant general sales manager; **F. Q. Murphy**, former Atlantic regional manager, and **W. O. Lampe**, formerly sales promotion manager. **V. C. Havens**, advertising director, will take over the added duties of sales promotion.

Robert J. Howison has been appointed sales manager of the Automotive Division, Morse Chain Co.

George Tharratt, formerly head of the production and illustration department of Douglas Aircraft Co., has been named chief engineer of Adel Precision Products Corp., Burbank, Cal., aircraft accessory firm. **Lynn Reynolds**, formerly Adel chief engineer, has been made vice-president and production manager.

Ryan Aeronautical Co., San Diego, Cal., has announced the appointment of **Bert Holland** as chief inspector to succeed **Mel Thompson**, who has been named assistant service manager.

Canada Orders Jeeps

The Canadian government has stamped its official approval on U. S. Army light reconnaissance cars, or "jeeps," by ordering 2000 of these units from Willys-Overland Motors of Toledo.

CENSORED

An exclusive feature prepared by the London correspondent of AUTOMOTIVE INDUSTRIES, M. W. Bourdon.

At a get-together luncheon of dealers of the Austin Motor Co., Mr. E. Payton, successor of Lord Austin as chairman of the company, said that after the war they would renew production of cars based on the 1939 models; modifications would include new steering and new instrument panels. In order to distinguish these early post-war cars from the pre-war models the radiator shell and front-end design would be slightly altered.

Experimental models under development by Austin in 1939 and still under consideration as an additional type is a simplified rendering of the 8 hp. car with a three-cylinder engine of the same bore and stroke as the eight. Other new models in prospect are a 14 hp., an 18 hp. and a 25 hp., all with air-conditioning and overhead valves. The latter as well as the former will be a new feature for Austin cars.

To make better meals and accommodations available for longdistance truck drivers, a scheme is to be put into effect whereby selected roadside restaurants are to be treated on the same basis as factory canteens in the matter of food supplies, providing they keep open day and night and cater to truck drivers exclusively.

A new system of maintenance and inspection for all types of Army vehicles has been put into operation. It is based on realization that regular attention will reduce maintenance work, and consists of a series of daily "tasks" to be undertaken by drivers. There is a separate task for each day and all are completed in 14 days. They are explained in a booklet issued with each vehicle delivered by the makers.

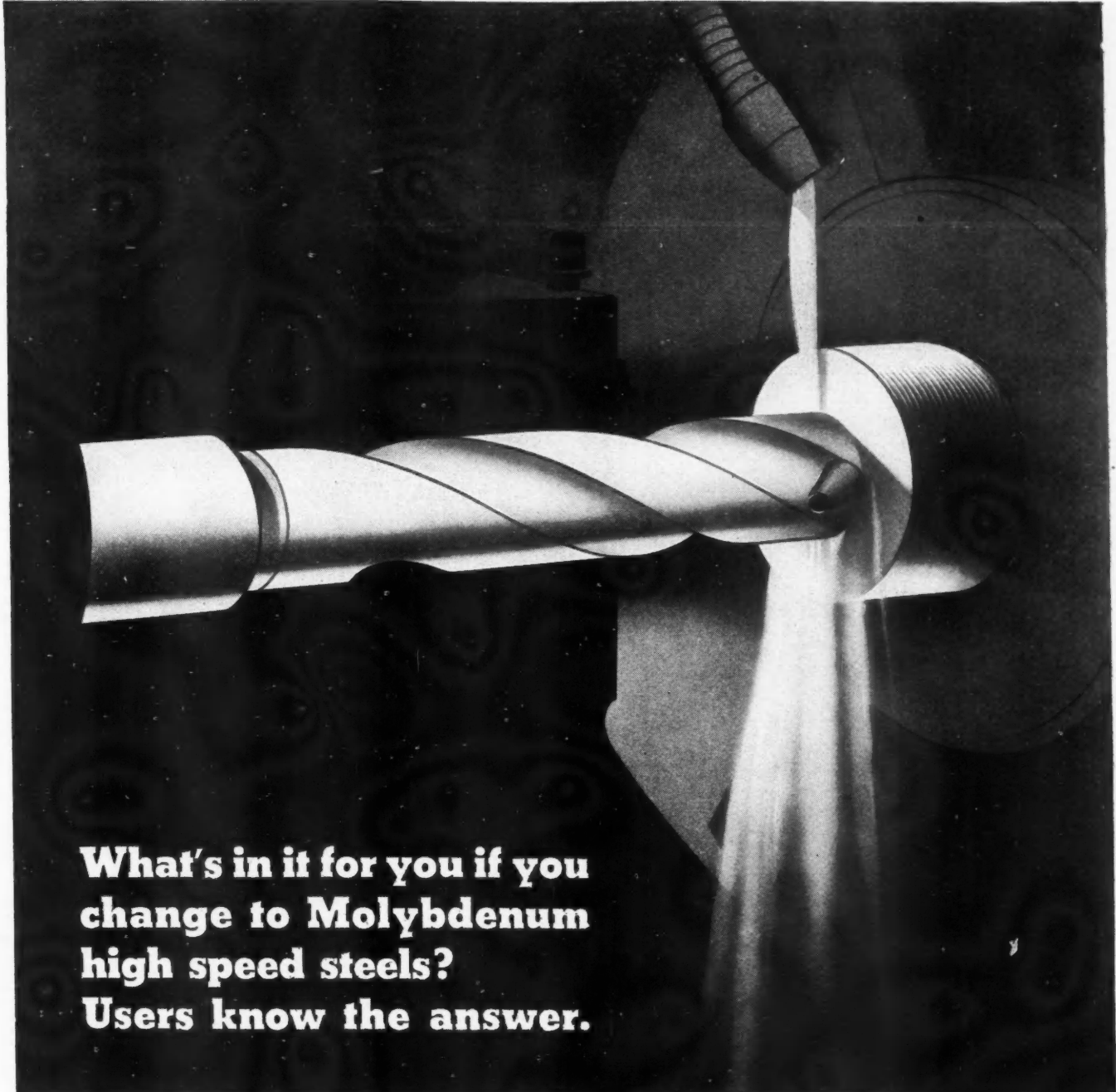
The Government has ordered 5,000 producer gas units of a non-proprietary type with the object of encouraging the large-scale use of producer gas by operators of heavy trucks engaged on transport of national importance.

Operators who normally would seek a permit to purchase new four-wheeled trucks of 5-ton load capacity in 1942 are to be asked—probably with a measure of coercion—to make use of tractor and semi-trailer outfits with a load capacity of up to 8 long tons, with the object of making better use of the power unit, fuel and labour.

Approximately 14,300 Army trucks were released from Service use during the first nine months of this year. Of these, 3,500 were reconditioned on behalf of the Ministry of Supply and allocated to other Government departments, while 10,000 were sold privately. The remaining 800 were acquired by their manufacturers (under the agreement made in August with the Society of Motor Manufacturers) for reconditioning and resale under Ministry of War Transport control as to both price and allocation.

Boots Cause Punctures

Studs from soldiers' boots are being blamed for an epidemic of punctured tires on main roads used extensively for route marches in England. One garage proprietor reports that out of 25 punctures, 22 had been caused by studs from Army boots.



**What's in it for you if you
change to Molybdenum
high speed steels?
Users know the answer.**

There are three good reasons for changing to Molybdenum high speed steels.

1. Equal cutting properties.
2. Better toughness.
3. Lower cost.

The three advantages combine to reduce machining

costs. Confirmation is found in the experience of thousands of shops that have changed over from Tungsten high speed steels.

Your tool steel supplier will give you information on the Molybdenum high speed steel analysis and heat treatment to meet each cutting requirement.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

Climax Molybdenum Company
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Acme

More Striking Power

This Curtiss Hawk P-40F fighter (at left) developed by the Curtiss-Wright Corp. for the Army and Britain, is claimed to be the "hardest hitting fighter in the world". With all guns in action and measured at their muzzles, the fire power amounts to more than 60 million ft.-lb. of energy per minute. It is the latest version of this famous line of pursuit ships and is powered by the Packard-built Rolls-Royce Merlin XX engine.

Business in Brief

Written by the Guaranty Trust Co. New York, Exclusively for AUTOMOTIVE INDUSTRIES

General business activity remains relatively stable at levels approximating the maximum heights recently recorded. The seasonally adjusted index of The New York Times for the week ended Nov. 8 rose to 128.2 per cent of the estimated normal from 127.6 for the preceding week. The index of The Journal of Commerce, without seasonal adjustment, for the same period declined to 127.7 per cent of the 1927-29 average, as against 128.6 for the week before.

Department store sales during the week ended Nov. 8, according to the Federal Reserve compilation, were 14 per cent above the corresponding total last year, as compared with a similar gain of 18 per cent for the preceding week.

Contracts awarded for heavy construction during the week ended Nov. 20, totaling \$64,000,000, were 14 per cent below the comparable amount last year; but the 1941 total to date is 57 per cent greater than the similar sum a year ago, according to Engineering News-Record.

Railway freight loadings in the week ended Nov. 8 totaled 873,585 cars, 2.4 per cent fewer than for the week before but 12.2 per cent above the corresponding number last year.

Business failures during the week ended Nov. 13, equaling the comparable figure in 1940 for the first time this year, numbered 203, as against 196 for the preceding week, according to the Dun & Bradstreet report.

Electric power production in the week ended Nov. 15 declined contrary to the usual seasonal trend but was 14.3 per cent above the output a year ago, as compared with a similar advance of 16.4 per cent a week earlier.

Crude oil production during the same period averaged 4,086,850 barrels daily, 9,250 barrels below the average for the week before but 16,850 barrels more than the currently required output as computed by the Bureau of Mines.

Average daily output of bituminous coal during the week ended Nov. 8 was 1,800,000 tons, as compared with 1,750,000 tons in the preceding week and 1,645,000 tons a year ago.

Cotton mill activity in the week ended Nov. 15 declined contra-seasonally. The index of The New York Times was 153.7 per cent of the estimated normal, as against 156.1 for the week before and 131.6 a year ago.

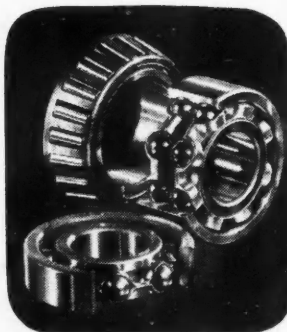
Professor Fisher's index of wholesale commodity prices for the week ended Nov. 14 was unchanged at 98.6 per cent of the 1926 average.

Member bank reserve balances rose \$113,000,000 during the week ended Nov. 12. Estimated excess reserves increased \$130,000,000 to a total of \$3,540,000,000. Business loans of reporting members rose \$60,000,000, bringing the net expansion in twelve months to \$1,738,000,000.

Ever hear an ANT walking?

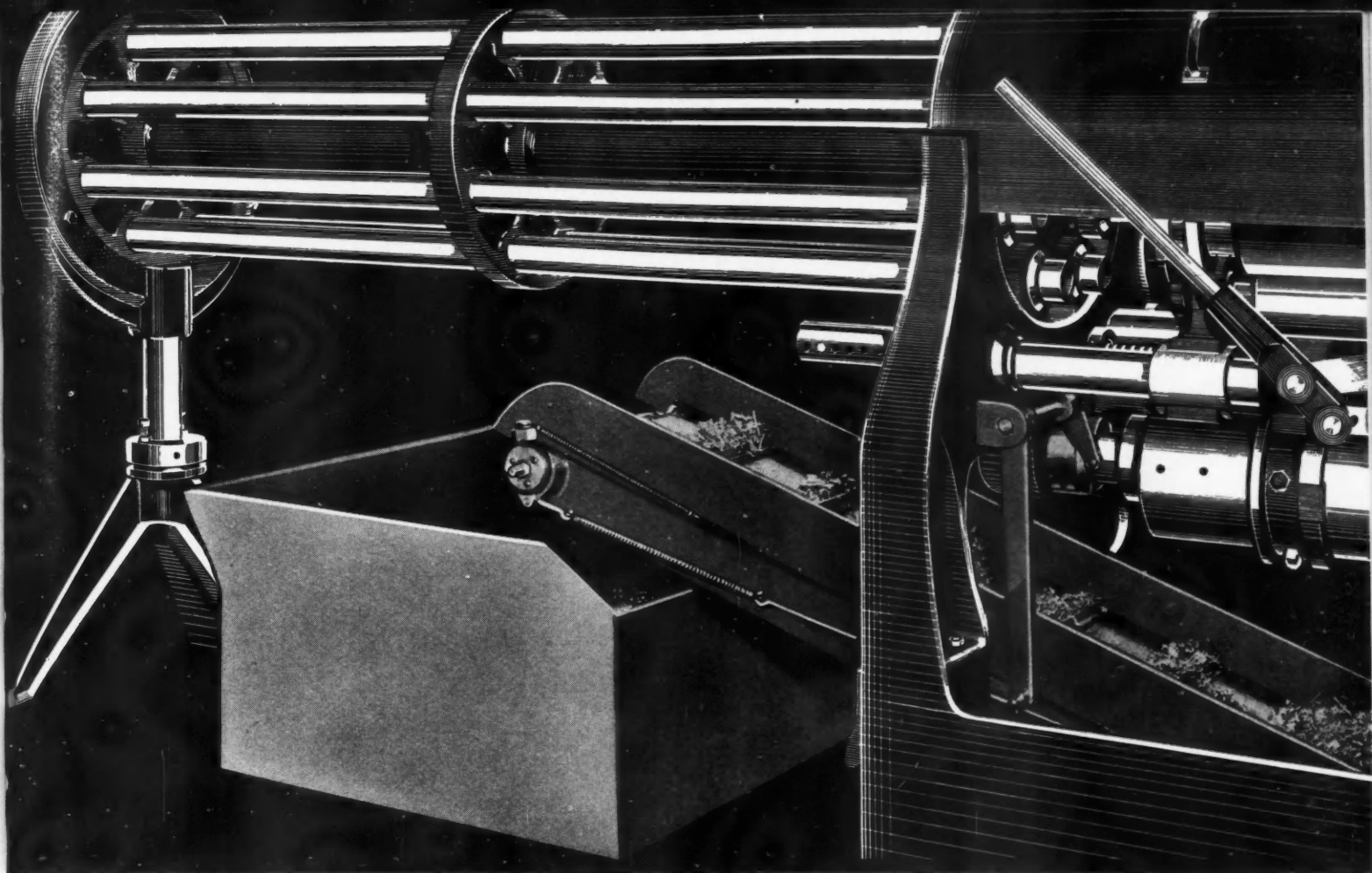
Hoover Engineers have. They have developed a scientific Radio Device so sensitive that an ant's footsteps thunder like the beat of a horse's hoofs on a cobble-stone street. On this super-sensitive device every Hoover bearing is tested for smoothness and quietness where bearing imperfections cannot escape detection. Hoover's unusually high standard of workmanship recognizes nothing short of near perfection. Is it any wonder that Hoover has won its place as . . . The Aristocrat of Bearings?

WITH HONED RACEWAYS . . . AN EXCLUSIVE HOOVER FEATURE



HOOVER *The Aristocrat of Bearings*

HOOVER BALL AND BEARING COMPANY, ANN ARBOR, MICHIGAN



Acme-Gridley

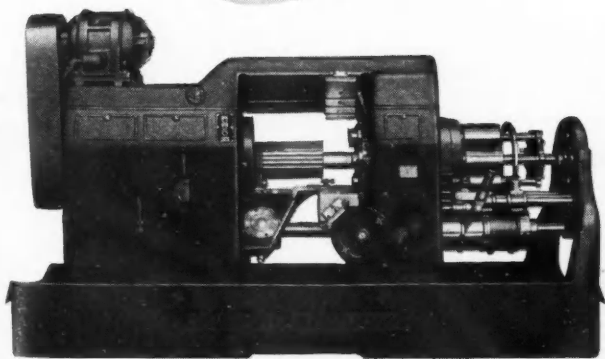
HOW *Chip Conveyors*

HELP ELIMINATE PRODUCTION LOSSES

Every time you stop a fast multiple spindle automatic to haul out accumulated work chips by hand there's a dead loss of 10 to 100 pieces or more. Continuous and automatic chip conveyors applied to Acme-Gridley bar machines eliminate that production loss.

An accumulation of hot chips in the pan materially raises the temperature of the cutting coolant. Continuous removal of chips keeps coolant temperature down. A cooler coolant makes tools last longer, cut smoother, produce better work.

The design of this chip conveyor is simple, requires no special drive, but operates from a cam drum on the end of the main drum shaft and is friction protected against chip jams—one more refinement that helps owners of Acme-Gridley bar automatics to utilize every possible production minute.



NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, O.

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

Brightwork Grace Granted; Fewer Car Models Proposed

**Industry Given to Jan. 1 to Use Brightwork in Stock;
May Freeze '42 Models, Drop Deluxe Cars and Equipment**

The automotive industry will be allowed 15 days' grace to use up existing stock of bright finish or trim on passenger cars. The OPM's Automotive, Transportation and Farm Equipment Branch of the Division of Civilian Supply, through Acting Chief Andrew

Stevenson, has recommended that the effective date be postponed to Dec. 31, so that manufacturers can use up stocks finished or in process as of Oct. 27. It was on Oct. 27 that OPM Director of Priorities Donald M. Nelson issued an order prohibiting the use after Dec. 15

of bright finish containing aluminum, copper, nickel or chrome.

Freezing of 1942 passenger car model designs also is to be ordered by the branch so as to eliminate the necessity for retooling for 1943 models and to conserve critical materials.

In postponing the effective date after which use of bright work will be barred, the branch said if any stocks remain in inventory on Dec. 31, manufacturers will be permitted to use them only if they are painted or treated in some manner so that they will lose their identity as bright finish permanently.

Mr. Stevenson announced the plan to postpone the effective date at a meeting on Nov. 19, with the passenger car subcommittee of the Automotive Defense Industry Advisory Committee.

At the same time, Mr. Stevenson announced that the branch has taken steps to exempt windshield wiper blade and arm assemblies, locks and lock covers, ventilator window latches and body trim screws from the provisions of the order. Manufacturers have informed the branch that substitute materials for plating these functional parts have not yet been found.

The passenger car subcommittee received suggestions from the Consumers Division of the Office of Price Administration for simplification of models. Among these suggestions were elimination of de luxe and heavy models, dropping of convertibles and limousines, reduction in amounts of extra equipment such as cigar lighters, fender guards, clocks, dual horns and dual tail lights, and reduction in the number of colors used. Hot water heaters and radios may also be discontinued.

Enos A. Bates

Enos A. Bates, 73, advertising manager and later sales manager of the Rayfield Carburetor Co., Chicago, from 1904 to 1922, died Nov. 12 at his home in Detroit.

Detroit Aviation Show

Detroit will stage a 10-day International Aviation Show, Jan. 16-25, at Convention Hall, under the auspices of the Detroit chapter of the National Aeronautic Association. Robert B. Evans, vice-president of Evans Products Co., will be chairman of the show committee.

CALENDAR

Conventions and Meetings

National Assoc. of Manufacturers, New York City	Dec. 3-5
NSPA National Defense Conference, Chicago	Dec. 11-18
Society of Automotive Engineers, Annual Meeting, Detroit	Jan. 12-16
Natl. Automobile Dealers Assoc., Chicago	Jan. 19-22
Motor & Equipment Wholesalers Assoc., Atlantic City	Feb. 23-28
American Society for Testing Materials, Cleveland	March 2-5

In Grinding...

**DON'T OVERLOOK
THIS VERY
IMPORTANT
FACTOR!**

BETTER GRINDING with CODOL

1. Reduced wheel loading and glazing
 2. Transparency for closer work
 3. Less frequent dressing
 4. Rapid chip settling
 5. Lower operating temperatures
 6. Rust preventative
 7. Finer finishes
 8. Economical
- Order a Trial Drum Today

Stuart's CODOL

Liquid Grinding Compound

100% grinding efficiency is best accomplished by careful consideration of the grinding fluid factor. The vital

part which a properly applied, specialized grinding lubricant plays is too often overlooked. It can mean unnecessary sacrifice in quality of finish, production speed, and cost of wheels.

These handicaps can frequently be eliminated by going over your grinding problems with a STUART OIL Engineer. His highly specialized experience in the application of modern grinding fluids will help you secure top efficiency.



ASK FOR this informative booklet. Free working sample upon request. Please send your name on Company letterhead.



For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

RUBBER....

greatest ally of defense



Rubber keeps air fleets aloft!

Self-sealing rubber gasoline tanks, self-sealing rubber gasoline and oil hose, molded rubber parts, rubber vibration-absorbing mountings, rubber insulated wires and cables, rubber refueling hose, rubber stratosphere suits keep our Army and Navy air fleets ready for "all out" defense.

Rubber keeps battle fleets afloat!

Back of the big guns is rubber... rubber hose, rubber gaskets, rubber insulated wires and cables, rubber cushions for delicate instruments, rubber life rafts, rubber deck cleats for safer footing, rubber propeller shaft coverings, rubber gun mountings, rubber expansion joints and thousands of other rubber items vital to fleet operations.

Here's the way U. S. Dealers help Rubber Conservation



The U. S. Dealers **TIRE CONSERVATION PLAN** offers motorists Priority Service on all safe methods of making tires last longer. The free "Four Vital Spots" book supplies important facts on the care and use of tires.



**QUALITY TIRES CONSERVE RUBBER FOR
DEFENSE...SAVE MONEY FOR CAR OWNERS**

A FEW OF THE MANY DEFENSE PRODUCTS MADE BY THE WORLD'S LARGEST PRODUCER OF RUBBER

Tires for trucks, guns and airplanes
Bullet-sealing tanks for airplanes
Bullet-sealing tire tube
Bullet-sealing fuel hose
Airplane refueling hose
Army gas mask carrier
Field telephone wire
Flame-repellent fabrics of "Asbestos"

Linon and rubber fire hose
Gas and oil hose
Water-repellent materials
Rubber lifesaving suit
Military and naval rain-coats of all kinds
Lighting wire
Diver's suit of laminated rubber
Rubber-lined aircraft battery case

Moulded airplane parts
Rubber boots
Aviation boots
Battleship fire control cables
Rubber expansion joints for naval use
Gun platform matting
Cleats of cellular rubber for destroyer decks
Tank pads of "Koyalon"

Special synthetic sponge matting for submarines
Airplane tail and landing wheels
Cushions for guns, Army tanks, seats, etc.
Gunner's eyepiece
Aviator's summer helmets made with "Lastex" yarn
Parachute jumper's shoes

Searchlight cables
Military aviator's suit made with "Lastex" yarn
Officer's uniform, back made with "Lastex" yarn
Assault wire for the Signal Corps



* REG. U. S. PAT. OFF.

UNITED STATES RUBBER COMPANY

6600 East Jefferson Avenue, Detroit, Mich.

Harmony Grows Between Management and Labor

Peace Rules Michigan Auto Industry as Hillman Tours Ford Plant; Chrysler and Auto-Lite Sign New Contracts

Prevalence of an "era of good feeling" in the automotive industry between management and labor has been evidenced in Michigan in the past month. When Sidney Hillman, Associate Director of OPM, visited Detroit for a tour of defense plants and con-

ferences with industrial and labor leaders just prior to the CIO annual convention, the Detroit Board of Commerce tendered him a luncheon. At the speakers' table were such industry chiefs as C. E. Wilson, president of GM; K. T. Keller, president of Chrysler, C. W.

Avery, president of Murray Corp.; and A. M. Wibel, vice-president of Ford. In the front row of tables among the 500 guests were Richard Frankenstein and Walter P. Reuther, vice-president of the UAW-CIO, and George F. Addes, secretary-treasurer of that body. Four years ago it would have been heresy to have such labor leaders at a Board of Commerce gathering.

Hillman, who was introduced by Governor Murray D. Van Wagoner, urged labor to stop its family squabbles, and said that just as "business as usual" is out during the national emergency, so are "strikes as usual."

"I believe in the right to strike," said Hillman, "but the less we strike now, the more that right will be preserved for later."

The new feeling pervading the automotive labor scene was evidenced again during the CIO convention, at which Philip Murray was re-elected president of the CIO. He visited the Ford Motor Co., where he conferred with Henry Ford and then had lunch with Harry Bennett, Ford Personnel Chief, and R. W. Thomas, president of the UAW-CIO, at the company cafeteria.

At a Thanksgiving night banquet tendered Murray by 2000 CIO delegates, the labor chief urged the more than 100,000 UAW members in Ford plants to build up the "most perfect labor-management relationship."

At the convention it was announced that the UAW-CIO paid a per capita tax on 640,000 members for October, making it rank just below the estimated 650,000 members of the United Mine Workers as the biggest union in the CIO.

The future objective of the automotive industry was indicated by Murray when he stated the union shop "may become the key issue of American labor policy during the coming months, now that the great anti-labor citadels of the steel and automobile industries have been reduced." The convention went on record as favoring mediation of labor disputes during the defense emergency, but insisted that labor's reasonable demands must not be denied. Intensive organization of southern factories and the aircraft and oil industries was advocated by the delegates.

Another indication of improved labor relations was the signing of a contract between the Chrysler Corp. and the UAW-CIO for 5700 employees at the Chrysler tank arsenal. Readjustment of wage rates ranging from 3 to 18 cents an hour for 2000 workers in special classifications was granted, along with a guarantee of wages equal to comparable Chrysler automotive rates for the remaining employees. The wage agreements will remain in effect until June 1, 1942, and the remainder of the contract until Nov. 19, 1942.

Electric Auto-Lite Co. of Toledo, signed a new one-year contract with the UAW-CIO Nov. 18, granting a 6-cent per hour wage increase to 5000 workers and wage adjustments so that the hourly minimum is 90 cents for men and 70 cents for women.

MOTOR TEMPERATURE CONTROL FOR THE ENGINES OF DEFENSE CIVILIAN AND MILITARY



THE DOLE VALVE COMPANY
1901-1941 Carroll Ave. Chicago, Illinois

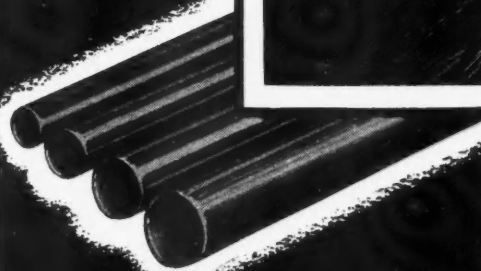
DOLE

Co-operating with
the Government
and Our Regular
Customers

Thermostats

A VIEW OF OUR TUBE MILL

where we are helping
the Defense Program
by making prompt delivery.



PROJECTILE ROTATING BANDS

OF PURE COPPER OR GILDING METAL

Our own electrolytic copper
refinery, within the same plant,
insures adequate material for
defense uses

LEWIN



MATHES

COPPER TUBING

LEWIN-MATHES COMPANY • EAST ST. LOUIS, ILLINOIS



Detroit News Photo

Government—Ford—Labor

Government, Ford and UAW-CIO officials joined in a visit recently to the Willow Run bomber plant of the Ford Motor Co. near Detroit. Left to right are Gov. Van

Wagoner of Michigan; Sidney Hillman, OPM; Charles E. Sorensen and Edsel Ford, Ford officials; and Walter P. Reuther and George F. Addes, UAW-CIO officials.

**"Ordinary Type Dust Collectors
Must Not Be Used
for Removing Magnesium Dust"**

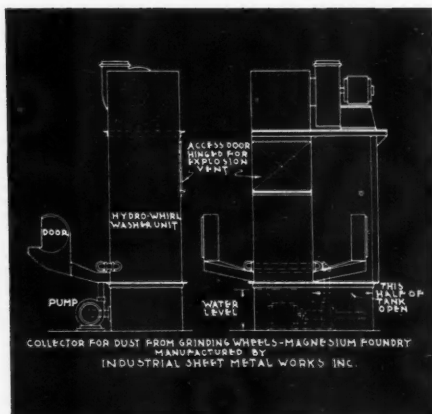
**... So Say Leading
Chemical Engineers**

The Hydro-Whirl meets all requirements for magnesium dust control.

Its high efficiency is attributed to the effective manner in which all the dust is trapped in the water. This new principle of dust control introduces the vital factor of safety which results in reduced explosion and fire hazards.

This collector is recommended by one of the largest Fire Insurance companies in the country.

If you process magnesium—grind, buff, or polish—you need the most efficient way of arresting the dangerous action of the dust. The Hydro-Whirl has it.



Send for the new folder.



Industrial Sheet Metal Works

Manufacturers of Hydro-Whirl Dust Collectors and Spray Booths, Ovens, and Parts Washers.
Completely Engineered and Installed.

634 E. FOREST AVE., DETROIT, MICH.

NEW YORK OFFICE
310 LEXINGTON AVE.

PUBLICATIONS

Munitions Cleaning Handbook, published by Magnus Chemical Co., outlines in detail the cleaning problems of modern munition production and also covers the outstanding cleaning operations required in the production of ordnance, transportation equipment and other material which must be built to meet demands of the Defense Program.*

A twelve-page booklet **Meehanite Castings in Defense Work**, has been published by the Meehanite Research Institute of America. It describes and illustrates Meehanite castings used in aircraft, gun and shell manufacture, machine tool castings and radio, marine, truck and steel mill equipment.*

The George Scherr Co. has issued a 4-page folder describing its line of **Atlantic Adjustable Limit Snap Gages**.*

Jos. T. Ryerson & Son's pamphlet comparing the two systems of steel identification, **Society of Automotive Engineers and American Iron and Steel Institute** contains the latest official data for both of these new systems of identification.*

Elastic Stop Self-Locking Nuts is the title of an attractive booklet published by Elastic Stop Nut Corp. In addition to describing and illustrating the features and various uses of the self-locking nuts, the booklet contains a section devoted to specifications and prices.*

The Roan Mfg. Co. offers a new bulletin describing its universal Tool and Cutter Grinder. It is a combination of fixtures which enables users to grind and sharpen all types of metal working tools, etc.*

Lempco Power Presses is the title of a booklet by Lempco Products, Inc., describing and illustrating their Series 300, 400-A and 500-A together with information regarding press attachments for all presses.*

Continental Screw Co. has issued in booklet form a new schedule of prices applying to **Holtite Aviation Products**.*

New literature by Westinghouse Electric & Mfg. Co. is as follows: second 1941 revision of **Quick Selector Catalog**; new bulletin describing **protective and productive floodlighting**; folder describing **fractional horsepower motors**.*

Skill in Machines, a folder by Acromark Corp., offers comparisons in marking methods and shows how particular available machines can do work ordinarily allotted only to skilled men.*

Helpful information for hydraulic engineers and others is contained in a new 12-page manual issued by the Watson-Stillman Co. The bulletin is one of a series now in preparation, covering design and operating characteristics of its machinery and equipment.*

The current issue of **Paint Progress**, published by New Jersey Zinc Co., contains a timely article on planning for metal maintenance.*

The Bristol Co. has prepared a new pocket sized folder describing its line of **Hex Socket Screws**, giving detailed data on sizes, dimensions, prices, etc.*

The Brown Instrument Co. has issued a new Catalog No. 8301, **Industrial Control Devices—Products of Minneapolis-Honeywell Regulator Co.***

The National Better Business Bureau, Inc., has issued a research bulletin **Reference to The Army and Navy in Advertising**. Copies may be obtained from the Bureau in the Chrysler Bldg., New York City, for 3 cents per copy.*

Clarifying the proper welding process for a particular metal under various circumstances, a clearly written, conveniently grouped 56 page book, **Welding Procedures** has just been published by Air Reduction.*

*Obtainable through editorial department, **AUTOMOTIVE INDUSTRIES**, Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

FOR NATIONAL DEFENSE



WARRANTY OF PERFORMANCE

EVERY POUND OF COMPRESSION
EVERY DROP OF GAS, OIL and WATER
Conserved...

WITH D.G. ON THE JOB



ORIGINATORS OF

Correctly engineered products from Synthetics, Plastics, Rubber, Cork, Fibers.

Gaskets to seal Oils, Gasoline, Refrigerants, Solvents, Chemicals, Gases, Water and Steam.

HIGH PRESSURE VACUUM, HIGH TEMPERATURE, SUB-ZERO

Special fabrications, acoustical materials, electrical Insulating, Fender Welts, Dash Liners, Spring Liners, Glass Run Channels, Glass Setting Tapes.

DETROIT GASKET & MFG. CO. • DETROIT, MICH.

January Truck Output Cut 35.9 Per Cent

A 35.9 per cent curtailment of January, 1942, light truck production for civilian use below January, 1941, output, was ordered recently by OPM's Priorities Division.

In connection with the automobile production plan, it was pointed out that under the OPM order manufacturers of both passenger cars and light trucks (those less than 1½ tons) may substitute truck production for passenger car production, provided combined quotas are not exceeded.

Light truck production in August, 1941-January, 1942, period, will be 145,018 compared with an output of 171,260 in the August, 1940-January, 1941, period a curtailment of 15.3 per cent. The program is designed to bring about a 30 per cent reduction for the full model year as compared with the previous model year.

FTC Issues Desist Order

The Federal Trade Commission announced recently that the General Motors Corp. and the General Motors Sales Corp. have been ordered to dis-

continue certain so-called monopolistic practices in their relations with General Motors dealers in violation of the Federal Trade Commission and Clayton Acts. These practices relate to "tying contracts" made with dealers requiring them to deal exclusively in General Motors products.

U. S. Labor Dept. Issues "Overtime" Clarification

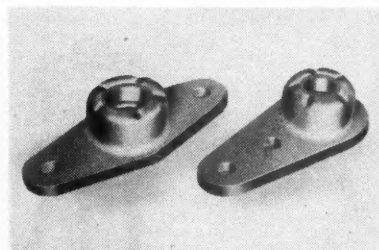
The following statement has been issued by the Department of Labor as a clarification of the "overtime" status of employees given time off on holidays:

"The question under consideration arises where an employee receives an hourly rate of pay or a salary for a regular number of hours per week (the equivalent of an hourly rate of pay) and is paid at such rate for hours not worked due to vacation, holiday, illness, or other similar cause. Where an employee is paid a salary without regard to the number of hours worked it cannot be said that he is paid for holidays and the like; the salary compensates for whatever hours he works, no more no less, and he has no set hourly rate of pay which can be attributed to hours not worked. Assuming, therefore, that an employee is paid at his regular hourly rate for hours when he is not at work due to vacation, holidays, illness, etc., the amount so paid is not compensation for hours worked and need not be included in computing the employee's regular rate of pay and overtime compensation."

Elastic Stop Nuts

ANCHOR type self-locking nuts for blind-mounting on general industrial equipment are now offered by the Elastic Stop Nut Corporation, of Union, N. J., following their successful application in aircraft construction.

Designed to provide vibration-proof fastenings for removable cover plates and other blind mounted attachments, the anchor nuts are permanently riveted to the inside of the structure. Bolts from the outside pass through the plate



Elastic Stop Nuts are designed to be vibration-proof

and the structure into the stationary nut, which incorporates a fiber looking collar, into which the bolt impresses its own thread, creating a moisture-tight seal and maintaining thread contact with a resilient grip.

YOU STILL GET ALL 3

We're working fast, building more and more Greenlee Automatic Screw Machines for defense work, but not too fast to make sure that every Greenlee turned off the assembly floor has been built right to measure up to the highest standards of **SPEED, ACCURACY, and QUALITY** obtainable.

1. Today the speed of the Greenlee Automatic . . . the speed designed and built right into every Greenlee Machine . . . is daily saving vital seconds on hundreds of defense jobs in Canada, England, and the United States.
2. And accuracy is not sacrificed one bit to get this speed. Greenlee Automatics, built to stand the wear and tear of high-speed production, will meet your most rigid specifications and give continuous, uniform accuracy day after day.
3. Even in our hurry to build more Greenlees, there are no short cuts to quality. When this emergency has passed Greenlee Machines will still be turning out ordinary peace-time parts just as 'fast and just as accurately as they now produce defense work.

SPEED

ACCURACY

QUALITY

GREENLEE BROS. & CO.

ROCKFORD ILLINOIS



CONSOLIDATED B-24'S FABRICATED WITH BOOTS SELF-LOCKING NUTS

80,000 POUNDS LIGHTER— THANKS TO A "MAGIC" NUT

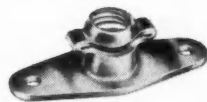
A single fleet of planes, being built for the United States Government by Consolidated, will carry 80,000 pounds* less dead weight, solely through the use of Boots Self-Locking Aircraft Nuts. As one result, they can lift that much more fire-power, armament or fuel.

Boots Nuts are of sheet metal construction—have all the required tensile strength of old-

fashioned nuts. They "outlast the plane," and can be reused as often as required in the airplane's maintenance.

The only one-piece, all-metal, self-locking nut to pass the rigid tests of the Army, Navy and Civil Aeronautics Authority.

*Consolidated's Chief Engineer figures a weight saving of 40 to 80 lbs. per B-24 due to use of Boots vs. nuts used in the past.

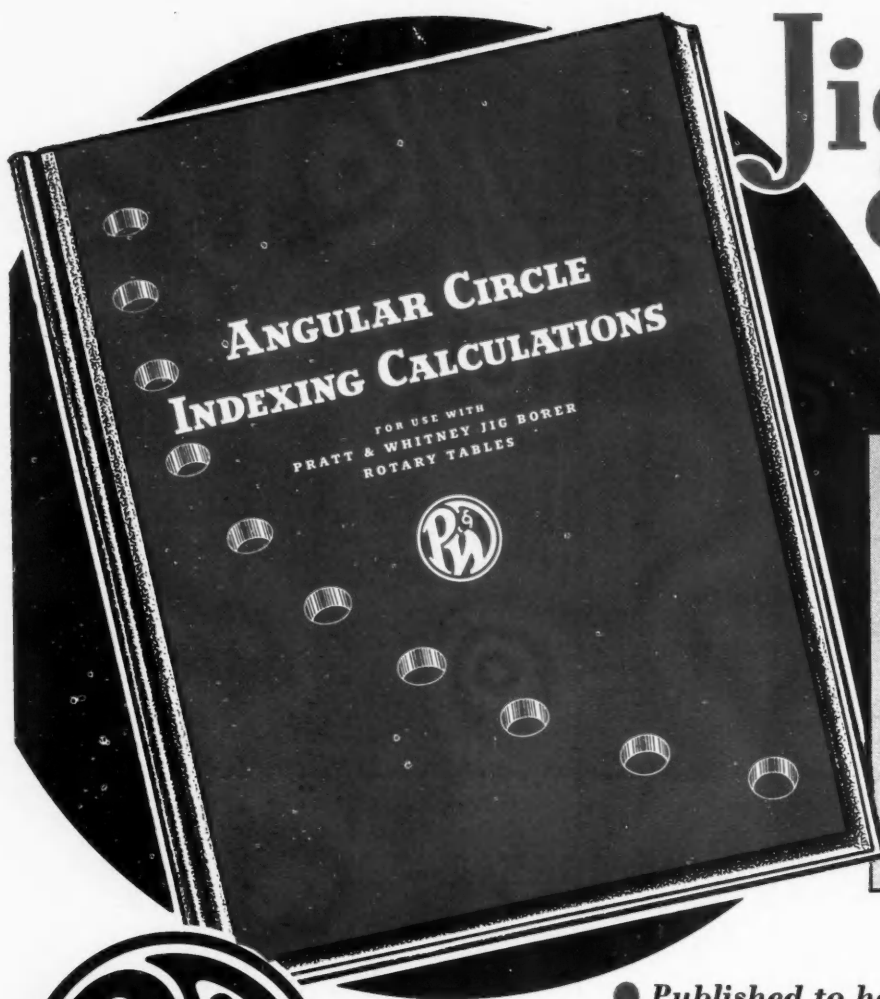


BOOTS

AIRCRAFT NUT CORPORATION

NEW CANAAN, CONNECTICUT

Get more out of your Jig Borer



New exact indexing figures eliminate time lost in calculating by draughtsmen and machine operators . . . costly errors avoided.

● *Published to help speed up National Defense*

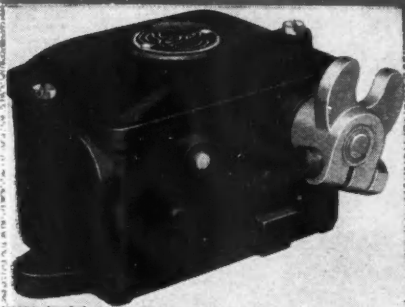


Here, for the first time, are all the necessary angles in degrees, minutes and nearest second for dividing a circle into any number of equal parts from two to one hundred inclusive. Correct chordal distances also are given in each case, accurate to six places. Now it is not necessary for jig borer operators to spend hours figuring out angles while their machines stand idle. Or, if the mathematics is done in the draughting room, there is an equal saving of time. In either case the errors are eliminated, costly mistakes and spoiled work reduced. This book is printed on heavy stock, cellophane laminated to stand up under continual use. We have made it available at just what it cost us to produce . . . \$10.00 a copy. It will save many times its price on the first job you have requiring polar coordinates. The edition is limited. To obtain a copy of "Angular Circle Indexing Calculations" send your order to Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn.

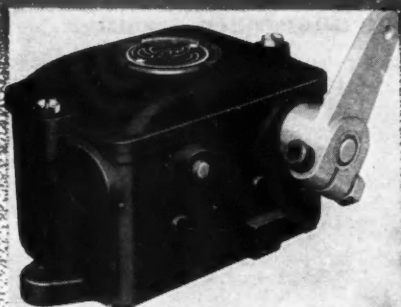
PRATT & WHITNEY

Packages of Service

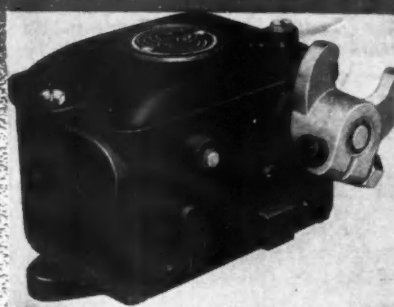
HEAVY DUTY, SNAP ACTION TRACK TYPE LIMIT SWITCHES—TYPE TL



TYPE "TISF"
Track Type Limit Switch
Straight Fork Lever



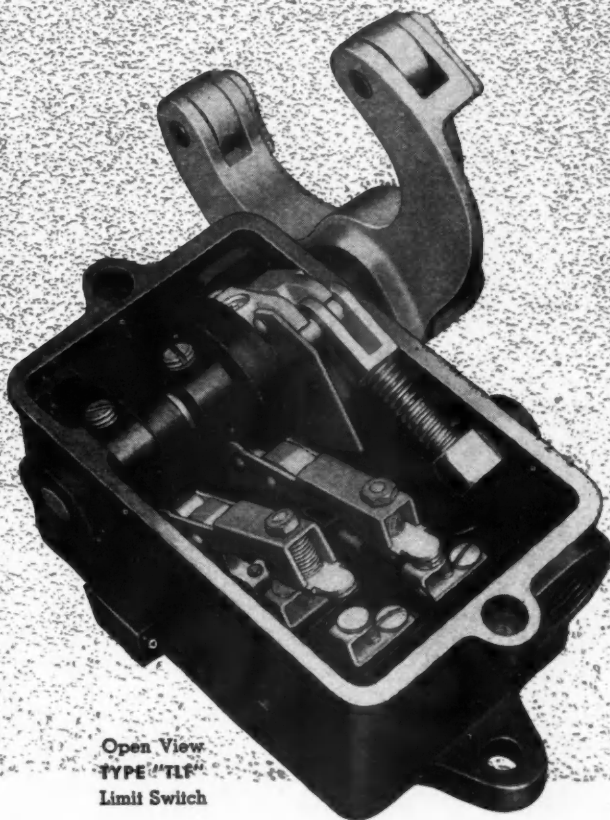
TYPE "TIS"
Track Type Limit Switch
Rod or Chain Type Lever



TYPE "TIOF"
Track Type Limit Switch
Offset Fork Lever



TYPE "TLF"
Track Type Limit Switch



Open View
TYPE "TLF"
Limit Switch

And what husky, sturdy packages, crammed with Service, because they're designed and built for Heavy Duty!

Enclosures are cast iron—and gaskets for Dust Tight (NEMA definition IC50-28) applications are available.

Bakelite Cams, rigidly attached to ample size steel shaft, operate the Contact Fingers. Shaft bearings never need lubrication.

Simple screwdriver adjustments permit any pole to be independently changed from normally open to normally closed or vice versa.

When Switch is tripped to either position, positive action toggle mechanism insures Switch remaining in that position until re-tripped.

Cadmium plated malleable iron operating arms are easily adjusted on shaft in any operating position.

Double break Silver-to-Silver Contacts, easily removable, insure long life.

Fully descriptive "3C" Bulletin 102, Type TL will be sent on request.

Our nearest office or agency will also supply complete information.



CONTINUE TO ROLL WITH CLARK CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST.

CLEVELAND, OHIO



Bethlehem Closes Seneca Plant

Priorities and an increasing shortage of steel for civilian industry have forced the Bethlehem Steel Corp. to discontinue production of steel sheets in its Seneca Division, Buffalo, an important producer of automobile material, an executive of the company announced.

Denison Expands

The Denison Engineering Co., Columbus, Ohio, has acquired a 26-acre plot of land in Columbus on which will be

erected a new plant containing 50,000 sq. ft. of floor space.

Output and Shipments Up On Pneumatic Casings

Shipments of automotive pneumatic casings during October, 1941, increased 11.6 per cent over September. October shipments, 5,867,175 units, were 6.2 per cent above October, 1940. Production, 4,834,308 units, was 5.9 per cent above September but was 4.8 per cent below October, 1940.

Replacement shipments during October, 3,756,963 casings, were 2.5 per cent

above September and 22.7 per cent above October, 1940, replacements. Stocks of automotive casings in the hands of manufacturers Oct. 31, decreased 20 per cent under Sept. 30 stocks to 4,122,836 units.

Ira C. Jones

Ira C. Jones, age 60, former New Jersey distributor and a director of the Studebaker Corp. of America, died of a heart attack on Nov. 25 at his home in Cranford, N. J.



Quickens Work

Portable fluorescent lights, encased in transparent Lucite, are used at the Lockheed Aircraft Corp. to help speed production of Lightning P-38 interceptors. They are helpful to employees when working in limited areas or making inspections in dark quarters.

Canadian Scrap Prices

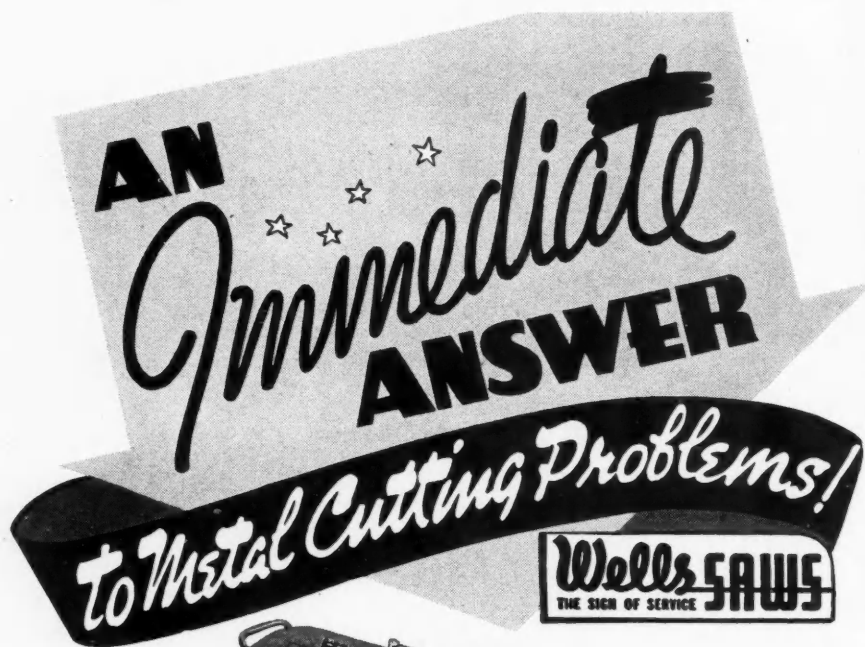
Scrap prices were recently fixed in Ontario and Quebec. For scrap iron delivered to a consumer's plant, the price for No. 1 machinery cast, gross ton, must not exceed \$23 at Toronto, Windsor, Walkerville, Ontario and Montreal. The price at Fort William is established at \$18 per ton. Lower prices are provided for No. 2 machinery cast iron scrap, automobile cast, plowpoints, chilled cast iron, white iron and stove plate cast.

Fire Truck Changes Name

The General Fire Truck Corp., Detroit, Mich., has changed its name to the General-Detroit Co.

Clifford S. Stilwell

Clifford S. Stilwell, president of the National Machine Tool Builders' Association, died of a heart attack at St. Luke's Hospital, Cleveland. He was fifty-one years old. Mr. Stilwell was executive vice-president of the Warner & Swasey Co., Cleveland, builders of turret lathes and other machine tools.



Now Built in 3 Sizes
No. 5—5" dia. round or
5" x 10" flat.
No. 8—8" dia. round or
8" x 16" flat.
No. 12—12" dia. round or
12" x 16" flat.

Also the No. 9 Upright Saw.



If you're faced with a metal cutting tie-up, here's a suggestion: Wells Metal Cutting Band Saws are quickly available to help you out. They easily and accurately cut almost any metal in almost any shape. You can use them for production, maintenance or odd jobs. Write now for details or call your mill supply house.

WELLS MFG. CORP. Three Rivers
Michigan

AC Continues to build **QUALITY**

AC is discharging its paramount obligation to Defense with a production which is well ahead of schedule.

AC's other obligation,—that of providing products to industry so that America can keep going,—is being discharged, as always, by building products of highest quality through design and production facilities second to none.

AC SPARK PLUG DIVISION
General Motors Corporation
FLINT, MICH.



AC BUILDS THESE QUALITY PRODUCTS

AIR CLEANERS
AMMETERS
CARBURETOR INTAKE
SILENCERS
CARBURETOR INTAKE
SILENCER AND AIR
CLEANERS
DIE CASTINGS
DIE CASTING
MACHINES
FLAME ARRESTERS
FLEXIBLE SHAFTS
AND CABLES

FUEL PUMPS
FUEL AND VACUUM
PUMPS
GASOLINE GAUGES
GASOLINE STRAINERS
ENGINE BEARINGS
IGNITION CABLE
TERMINALS
INSTRUMENT PANELS
LUBRICATING OIL
FILTERS
FUEL OIL FILTERS

OIL FILTER REPLACE-
MENT ELEMENTS
AND CARTRIDGES
AIR GAUGES
OIL GAUGES
RADIATOR PRESSURE
CAPS
REFLEX SIGNALS
REPLACEABLE AIR
CLEANER
ELEMENTS
SPARK PLUGS

SPARK PLUG
CLEANERS
SPARK PLUG
GAPPING TOOLS
SPARK PLUG
TESTERS
SPEEDOMETERS
SPEEDOMETER
CABLES
TACHOMETERS
THERMO GAUGES
VACUUM PUMPS

Army Orders for Truck Producers

(Continued from page 52)

Current military truck output is at a rate of about 4000 units weekly, with a maximum possible of 6000 per week under existing facilities. With the Army employing four and six-wheel drive vehicles exclusively, a great strain has been placed on the productive capacity for transfer cases, constant velocity joints, gear cutting and grinding machinery and axles and transmis-

sions in the higher capacity truck field. Army experts at present are trying to ascertain the replacement factor for equipment as a result of the maneuvers in Louisiana and North Carolina. Nor does the Army yet know the number of vehicles, or repair "floats," that will be laid up at one time.

Yellow Truck & Coach Mfg. Co. at Pontiac, one of the largest truck builders, is turning out military vehicles, mostly of the 2½-ton 6 x 6 variety, at the rate of 1800 per week. The company has received orders for 98,000 military units valued at \$230 million, of which about 49,000 costing \$119 million have been delivered. Ninety-five per

cent of the remaining orders will be completed by April 10, 1942.

In a cooperative arrangement, Chevrolet is assembling 550 GM Truck Army units weekly at its St. Louis plant. The 270-cu. in. engines for these trucks are made by Chevrolet at Flint with automotive machinery and equipment that was transferred from the Chevrolet plant at Tonawanda, N. Y., when that plant was converted for aircraft engine manufacture. Eventual production rate on these engines will be 900 weekly.

Chevrolet will be producing Army 4 x 4 trucks, mostly of 1½ tons and under capacity, at a rate of 1000 per week in eight assembly plants by Jan. 1. In aiding the 6 x 6 truck production program of Yellow Truck & Coach, Chevrolet will turn out 1300 sets of axle and transfer cases, 1800 sets of sheet metal and 1000 sets of transmission gears weekly.

Two new aircraft equipment and parts plants have been authorized for the Detroit area. Vickers, Inc., a subsidiary of Sperry Corp., will build an \$8,590,957 plant financed by the Defense Plant Corp. for the manufacture of hydraulic aircraft equipment, probably for gun turrets. The plant will contain 350,000 sq. ft. and employ about 3000 men.

Ex-Cell-O Corp. has been given a \$2,300,000 award for a new plant to manufacture aircraft engine parts adjacent to another new plant already in operation in Highland Park, Mich. Wilcox-Rich Division of Eaton Mfg. Co. has been granted \$465,235 for new plant and equipment at Saginaw for making aircraft engine parts.

Recent national defense orders include \$1,863,552 to Clark Equipment Co. for Air Corps tractors; \$561,337 to Caterpillar Tractor Co. for cranes and tractors; \$173,339 to Timken-Detroit Axle Co. for adapters; \$105,452 to White Motor Co. for scout car spare parts; \$233,851 to Sparks-Withington Co. for airplane equipment assemblies; \$299,500 to National Automotive Fibers, Inc., for 100,000 cotton-filled comforters; \$223,385 to Yellow Truck & Coach Mfg. Co. for spare truck parts; \$594,891 to Chevrolet for 1½-ton trucks; \$1,461,075 to Thompson Products, Inc., for aircraft fuel pumps; \$725,000 to Aeroproducts Division of GM for propeller assemblies.



ONLY A 3 PAGE CATALOG, BUT FULL OF PROFITABLE IDEAS

• You can get increased production from duplicating your present standard equipment, but here's a better way to do more with fewer machines.



PAGE ONE

Experienced men, familiar with processing and cost saving methods, analyze your problem from the start. Objective: to get the most done with a minimum of cost.



PAGE TWO

Experienced men, familiar with machine design as it fits into processing methods and detailed machine design, create the preliminary and final machine design.



PAGE THREE

Experienced men, familiar with building machines, manufacture and assemble the final machine and put it into profitable production in your plant.



A PAGE IN POINT...

• This "one-lunger" gets seven operations in 33 seconds. The operations are: Rough, semi, and finish the main bore . . . hollow-mill, face, and drill four holes on the joint face, and drill three holes on the manifold pad. Three standard machines could have handled the job, but in about one-third production—meaning nine operators for equivalent production.

The machine we furnished is our 912 . . . standard, except for tooling and fixtures. That means you can get the features of standard machines in special machines that *do more for less*.

We've done a lot of this type of machine designing for low, and high production manufacturing . . . will be glad to work with you on your knotty production jobs. More proof of the success of this type of machine building is in our 3 Point Design bulletins . . . write for your copies.

W. F. AND JOHN BARNES

ROCKFORD ILLINOIS

DESIGNERS AND BUILDERS OF DRILLING, BORING, TAPPING, MILLING, AND HONING MACHINES TO SUIT YOUR PARTS—YOUR PRODUCTION.

ADVERTISING

Kenneth Collins has been appointed vice-president in charge of merchandising for Arthur Kudner, Inc.

A. E. Aveyard has joined Hayes, MacFarland & Co., Chicago advertising agency, as a partner and vice-president and the name of the agency has been changed to MacFarland, Aveyard & Co.

"Horizons," Hudson Motor Car Co. magazine, won the Honorable Mention award in the 13th Annual Competition conducted by the Direct Mail Advertising Assn.

WINGS OVER AMERICA

depend upon
TROUBLE-FREE FASTENINGS

Obviously there can be no compromise with quality—no element of doubt—in the selection of fastenings upon which depend the safe, successful performance of aircraft and all defense products. Long the choice of America's important industries, HOLTITE fastenings are playing an increasingly vital part in the defense program.

Fully familiar with aviation requirements and government specifications, this plant is completely equipped to produce regular and special fastenings from SAE 2330, SAE 3135, SAE 4130 steel, brass and other alloys with Class 3 fit, and Cadmium plating to .0002" and .0003".

For accuracy, strength, uniformity and complete dependability specify HOLTITE on your next fastening order—regular or special.



CONTINENTAL SCREW CO

New Bedford, Mass. . . Warehouses at Detroit & Chattanooga

November Copper Demand Estimated at 150,000 Tons

During November there was a demand of 150,000 tons of copper for direct military and Lend-Lease use with only 128,197 tons of this critical metal available, the Office of Production Management reports. To partially fill the gap, OPM expected to salvage 14,000 tons of scrap copper. It was pointed out that some of the defense demand might be intended for production use at a later date, but the figures are considered a fair representation of the extremely "tight" situation.

One prospect of a major saving of copper stocks lies in the projected substitution of steel for brass in cartridge cases and bullet jackets. However, although Army and Navy Ordnance technicians have experiments under way, it is estimated that production on a large scale in this field might not be possible for about 18 months.

ASI Show Off; MEWA & MEMA Plan Joint Meet

The Automotive Service Industries Show originally scheduled for Atlantic City, N. J., for next February, has been

cancelled. This action followed a poll on the subject taken by the three supporting organizations—the Motor & Equipment Mfrs. Assn., the National Standard Parts Assn., and the Motor & Equipment Wholesalers Assn. A total of 505 votes was cast against holding the show while 270 were in favor.

The MEWA and the MEWA, however, plan holding concurrent conventions at Chicago in February.

The NSPA will meet at the Sherman Hotel in Chicago, Dec. 11-18, for an "industrial defense conference."

U. S. Will Inspect Parts Distributors Books

Inspection of all automobile parts and accessories distributing establishments will be resumed by the Wage and Hour Division, U. S. Department of Labor, in January to ascertain compliance under the Fair Labor Standards Act. Automobile parts and accessories distributing establishments are among the group of businesses whose transactions generally are the type which must be measured on a volume basis to determine whether they are exempt under the law as retail or covered as non-retail.

English Revive Interest in Producer Gas

A revival of interest in producer gas for motor vehicle operation has recently been evident in Great Britain, according to information received in the Department of Commerce. This is probably due to mechanical improvements which have been made in the construction of producer gas units.

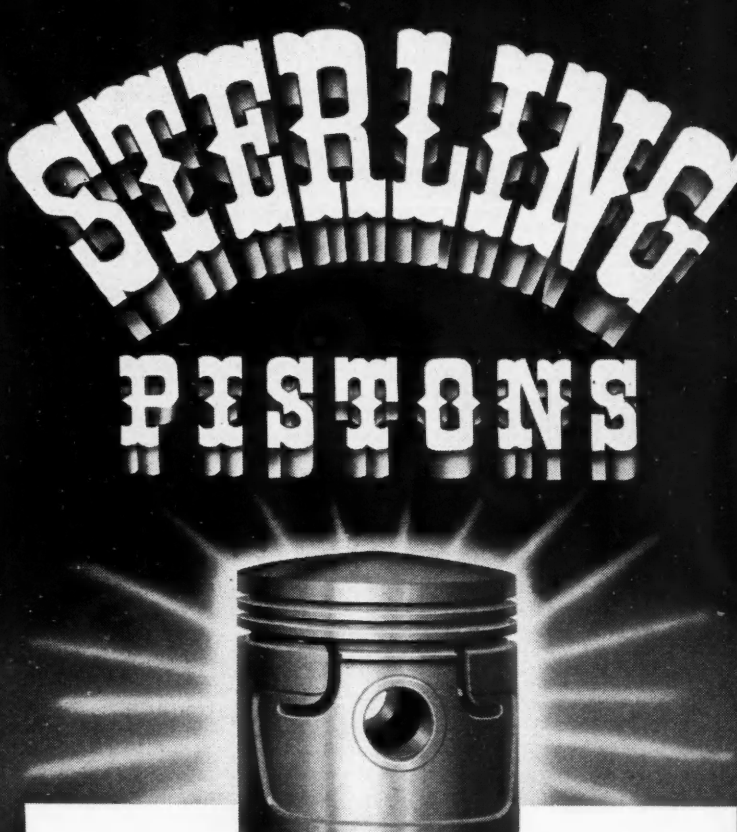
Lost Man-Hours Rise

The week ending November 21, showed a marked rise in lost man-hours in defense plants due to strikes. During that week there were 13 strikes in progress involving 222,821 men for a total loss of 5,076,060 man-hours.

Toluene Production

The petroleum fraction used for the catalytic manufacture of toluene is normally a portion of ordinary gasoline, which is put through a number of further chemical alterations to make toluene. Even doubling the present production so that 200-million gallons of toluene were made from gasoline would have little effect on the supply of motor fuel, it is reported, because this huge amount of toluene, enough to make 2000-million lb. of TNT, would be less than 1 per cent of the annual production of more than 25,000-million gallons of motor fuel.

The annual production of toluene from the plants now operating and under construction totals 100-million gallons, enough to make 1000-million lb. of TNT, with 70-million gallons coming from petroleum and only 30-million gallons from coal carbonization.



STERLING PISTONS

THE PISTON SPECIALISTS

Years of "knowing how" to manufacture good pistons *plus* introducing accepted new designs *plus* over forty million pistons now in service *plus* the continued choice of Sterling pistons for original equipment qualifies Sterling as the piston specialists.

STERLING ALUMINUM PRODUCTS, INC.
SAINT LOUIS



3 **HELPFUL DATA MANUALS**

*for production men who
want to speed-up
output on Defense Orders*



Here in these three manuals are concisely described the latest, successful methods for handling a wide range of metal cleaning and related work on a **SPEEDY**, safe, efficient basis. They give formulas, methods and other valuable data based on over 32 years' experience. Write today for booklets you want!

32 PAGES OF PRACTICAL DATA ON METAL CLEANING

Describes cleaning brass, copper and zinc alloys; cold rolled and polished steel; zinc and antimonial lead die castings; tin alloys; hot and cold solution cleaning; aluminum and magnesium alloys; barrel burnishing; Oakite Oxbrite Process; rust removal; and other data.

20 PAGES ON IMPROVING CUTTING AND GRINDING

Discusses economies and other advantages of Oakite Cutting and Grinding Compounds in machining steel, brass, copper, bronze, aluminum. Gives successful, widely used formulas; methods for rust-proofing parts in production; describes Oakite drawing and stamping compounds.

12 PAGES OF HELPFUL PICKLING AND NEUTRALIZING INFORMATION

Contains tested, proven ideas and suggestions for increasing efficiency of production pickling and neutralizing operations. Ways to make savings in both acid and metal. How to eliminate over-pickling, reduce acid fumes; how to inhibit rust; and reference data and charts.

More Than 20,000 Concerns

are benefiting today by the speed, safety, efficiency and economy that Oakite cleaning materials and methods are successfully providing on Defense Orders and other work. Tell us the job you want performed **FASTER** and better and we will do our best to secure the results required.

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**all THREE
ARE FREE**

*Write for your copies
NOW!*

OAKITE
MATERIALS...METHODS...SERVICE



CLEANING
FOR EVERY CLEANING REQUIREMENT



Ohio Crankshaft Co. Has 21st Anniversary

Francis S. Denneen (left), secretary-treasurer, and William C. Dunn (right), president, founders of Ohio Crankshaft Co., Cleveland, were hosts Nov. 18 to 115 industrialists and Government officials at the company's 21st anniversary celebration, which included a special luncheon and the first official inspection of its new \$4,500,000 subsidiary defense plant, Ohio Crankshaft, Inc. At this plant, which occupies 229,000 sq. ft. of floor space, crankshafts are in production for Wright Cyclone 14-cylinder engines. The company now operates four plants with 450,000 sq. ft. of floor space. The entire production is for defense equipment.

Tool Shipments Rise; Employment Up, Too

Machine tool shipments rose to \$77,200,000 in October as compared to \$68,700,000 in September and \$64,300,000 in August, the National Machine Tool Builders' Association reports. The October shipments indicate that the industry will exceed its announced goal of \$750 million in 1941.

Employment in the industry has also expanded by 8 per cent, according to reports from two-thirds of the industry's plants.

Reo to Make Tank Destroyers

Reo Motors, Inc., at Lansing has received a contract for production of a new type of mobile trackless tank equipped to carry a 75 mm. anti-tank cannon. The 8-wheel armored vehicle driven by a powerful diesel engine is capable of speed in excess of 60 m.p.h. and carries a fuel supply for 800 miles. Each of the eight wheels is independently sprung and this makes for a more stable gun platform. The vehicle has been tried out by the Army at Fort Knox, Ky. First deliveries are scheduled to begin by spring.



• • • Unequalled SURFACE SMOOTHNESS and SPHERICITY

The series of lapping operations performed as a matter of course in the Strom plant give Strom Steel Balls a degree of surface smoothness and sphericity that has always been unequalled in any other regular grade of ball. Only through such unique lapping practice can extreme precision be obtained.

Physical soundness, correct hardness, size accuracy, and sphericity are guaranteed unconditionally in all Strom Balls.

Other types of balls—*stainless steel, monel, brass and bronze*—are also available in all standard sizes. Write for catalog and prices.

Strom

STEEL BALL CO.

1850 So. 54th Avenue, Cicero, Ill.

The largest independent and exclusive Metal Ball Manufacturer

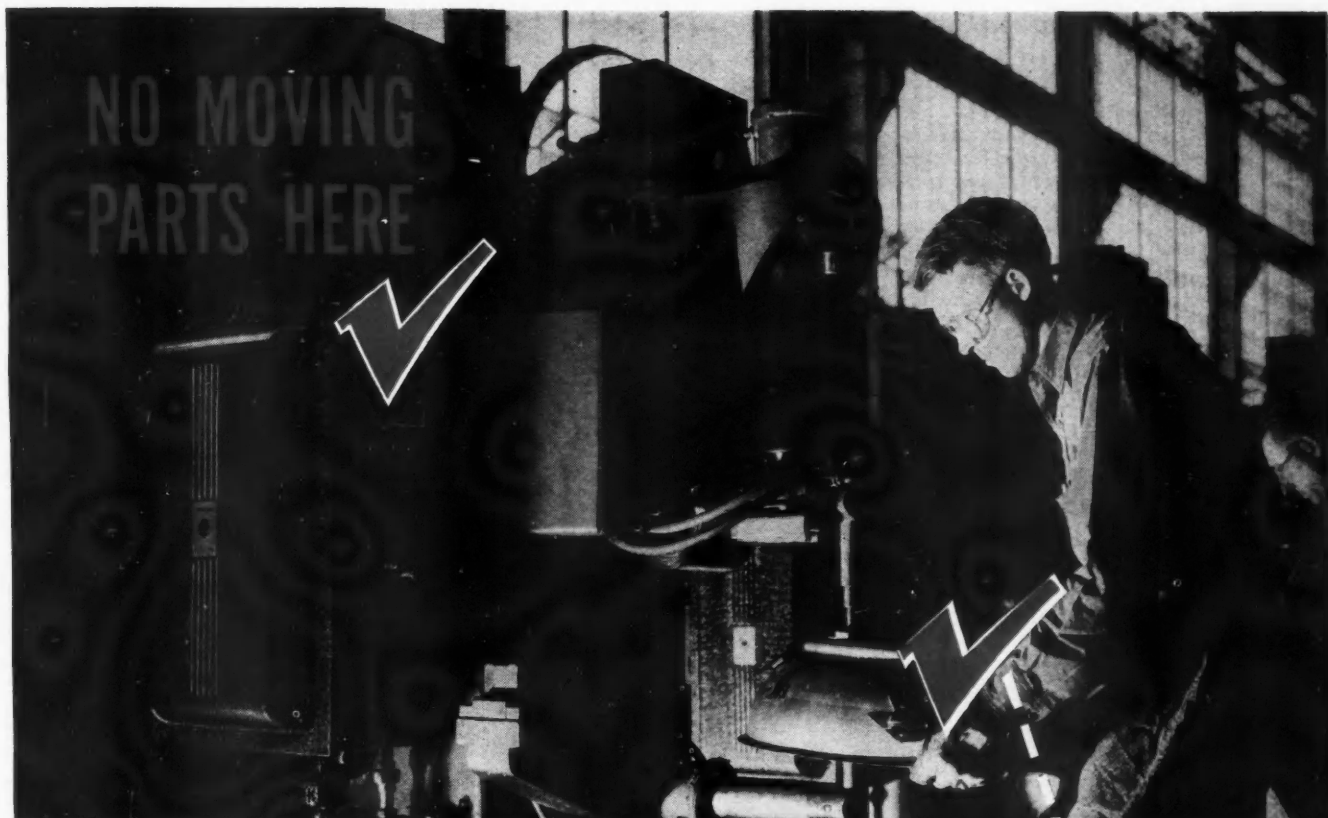
40 YEARS AGO

The secretary of the National Automobile Racing Association appeared before the police commissioners of Newport recently and asked about the detailing of policemen. He was informed that the police would not assist them in any way, but that men would be sent to protect the citizens of Newport. At a meeting on the evening of August 23 the following was passed:

"To the National Automobile Racing Association of Newport:

"We are of the opinion that the resolution of the City Council of Newport in relation to the use of certain streets by your association for the purpose of holding races does not contemplate nor authorize the speeding of machines in such races beyond the limits of the law. We do not, therefore, anticipate that it is your intention to become lawbreakers by exceeding such limit. Nevertheless, as it is commonly reported and believed that some of the machines taking part in the race will greatly exceed the legal limit, we feel it but just that the board should notify you that any contemplated violation of the law governing the speed of such vehicles meets our disapproval, and that we shall take all reasonable steps to enforce the law."

From the *Horseless Age*, August, 1901.



Fewer time-outs here

WELD-O-TROL PAYS DIVIDENDS

IN TIME: saves man-hours formerly required for maintenance.

IN PRODUCTION: adds to effective production time.

IN WELD QUALITY: Takes full advantage of the accuracy of your timer by eliminating mechanical delay in contact; produces more uniform welds.

You can reduce the number of time-outs required for maintenance, and increase productive time at the resistance welder—by switching to Weld-O-Trol, the power switch with no moving parts. Easily installed with your present welder-timer facilities, Weld-O-Trol makes instantaneous contacts *electronically*, with no noise, no flame.

Any mechanical method of circuit interruption requiring frequent operation of moving parts also requires regular maintenance and periodic replacement. Figure the savings in maintenance and replacement costs; figure the increase in production made possible by Weld-O-Trol—and you'll see why users say this piece of equipment soon pays for itself! New bulletin B-3025 gives you all the facts. Send for it. WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., Dept. 7-N.

J-21153

SWITCH TO THE POWER SWITCH WITH NO MOVING PARTS

Westinghouse



How Surface Condition Affects Fatigue Strength

That surface conditions have an important effect on fatigue strength has long been known. Fatigue failures usually occur at points of stress concentration, and the smoother and harder the surface at such points, the higher will be the fatigue strength. Various methods are therefore resorted to with a view to improving surface conditions at points of likely stress concentration. The effects of such methods on the fatigue strength has been investigated by O. J. Horger

and H. R. Neifert of the Timken Roller Bearing Co. who described the methods employed and results obtained by them in a paper read before the Society for Metals.

Some of the tests were carried out on railcar axles which had cast wheels pressed or shrunk on. When both the axle and the bore of the wheel hub were given the Chrysler superfinish, the endurance limit, determined by breaking of the axle, was 12,500 psi as compared with 11,000 psi when both were smooth-turned. The question then arose whether the method of securing the wheel to the axle—by pressing or shrinking—had any effect on the en-

durance strength. Two axles were turned up from the same heat of steel and both given a smooth-turned finish. The shrunk-on wheel was heated to 500 deg. Fahr., slipped over the axle, and allowed to cool. With the wheel pressed on the axle, the endurance strength was 11,000 psi, as compared with 9,000 psi when the wheel was shrunk on.

Surface rolling of plain cylindrical specimens increased the endurance strength materially, although it increased the surface irregularities. For instance, when specimens of 0.3 in. diameter were rolled with rollers of 7/16-in. diameter and 3/32-in. contour radius, under a pressure of 250 lb. per roller the surface irregularities increased from 3 to 310 micro-inches, and the endurance limit from 39,800 to 52,600 psi (32 per cent). The authors concluded that rolling makes a greater improvement in the fatigue strength than any form of surface finish, such as machining, grinding, or polishing.

It is well known that rolling the wheel seat of axles will greatly increase the breaking strength of the axle. The endurance limit for breaking off of a 2-in. axle in the wheel, for SAE 1045 steel, normalized and tempered, was increased from 13,000 to 33,000 psi by surface rolling of the wheel seat on the axle.

In one case fatigue failures occurred in a member of 5-in. diameter, subjected to alternate tension and compression, at a fillet of between 1/8 and 3/16 in. radius. The material was SAE 4340, quenched and tempered to 270-300 Brinell. As originally made, a number of fatigue failures occurred in service after a very short life, but after the fillet surface was rolled, no more failures occurred.

Metal Spraying

Surfaces on metal parts are sometimes built up by metal spraying, and the question then arises as to what effect this process has on the endurance strength. To get an answer to this question, 2-in. plain cylindrical specimens of SAE 1035 annealed steel were tested as rotating cantilever beams with and without a sprayed-on coating of steel. The coating was of carbon-steel wire (0.40 per cent carbon), 1/8 in. thick after machining and polishing. The uncoated specimens had an endurance limit of 30,000 psi, the coated ones of 28,000 to 30,000 psi.

A further subject investigated was the strengthening effect of flame hardening on press-fitted assemblies. Plain cylindrical axles of 2-in. diameter, made of SAE 1045 steel, normalized and tempered, were flame-hardened at the wheel-fit surfaces. By this treatment the endurance limit for breaking off of the axle at the wheel was increased from 13,000 psi for the conventional assembly to 45,000 psi for the flame-hardened sample. The flame-hardened axles did not actually break at the load mentioned, but since a gain of 246 per cent in fatigue strength had been made already, it was thought useless to push the investigation further.

BENDIX DRIVE

Approved by

MANUFACTURER
ENGINEER
CAR DEALER
MOTORIST!



remarkable invention has performed brilliantly. Adaptable to every type of starting control—floor button, clutch or accelerator pedal, dash button or, with Startix, completely automatic switch-key starting—the Bendix Drive unfailingly starts millions of motors every day throughout the year.

There's a Bendix Drive for every size and type of automobile, marine or Diesel engine. Renewal parts and complete replacement drives are available in every civilized country. In addition, a liberal Exchange Plan serves the convenience of motorists and dealers throughout the United States.

THE acceptance of the Bendix Drive by all who make, sell or drive automobiles speaks volumes for the excellence of "the mechanical hand that cranks your car." Their approval, won by its own inherent advantages, has made Bendix Drive one of the world's most widely used automotive components.

Since the first cars were automatically cranked by Bendix Drive, this

ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
ELMIRA, NEW YORK

**WHERE THE PRESSURE IS GREATEST
AND THE GOING TOUGHEST—**



they use
**STEEL
CASTINGS**

The high pressure and other parts of this giant steam turbine that are not shaded are steel castings.

Steam at pressures over a thousand pounds per square inch—temperatures over 900°F.—these conditions are tough.

Imagine them in a steam turbine, with a rotor whirling at 3,600 rpm—where tolerances are close, where expansion must be under rigid control, where metal fatigue is terrific!

That is why turbine engineers specify steel castings for the casings, blade rings, bearing shells, gland covers and dummy seal rings of steam turbines, from the largest size to the smallest.

Steel castings are proving their worth for thousands of important parts—from a few ounces up to many tons. They are so adaptable

that they fit all conditions. They combine great strength, rigidity, controlled hardness and resistance to fatigue with low first cost and low finishing and assembly cost.

The steel foundry industry is ready to work with you on improving and modernizing your product, offering you the combined research and technical facilities of a whole industry.

Why not consult your own steel foundryman? He is ready to help you speed up production, or make a better product. Or you may write to Steel Founders' Society, 920 Midland Building, Cleveland, for information. No obligation, of course.

MODERNIZE AND IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS

Production Lines

(Continued from page 43)

On Standards

At the last meeting of the National Machine Tool Builders' Assn., an important announcement was made concerning the adoption of Machine Tool Electrical Standards, offering a uniform code which should be of utmost value both to the manufacturer and the user. One of the objectives of the new code is to provide a standard that will meet the needs of the user and, at the same time, relieve him of the necessity

for accompanying each order with specific instructions. It is realized that the final responsibility for the successful operation of the machine lies in the hands of the manufacturer since the proper selection of controls has become an integral part of machine tool design. It is hoped that machine tool users will find the new code well worth unanimous support. Incidentally, it might be noted that the code does not prohibit the use of special features

essential to the operation of some unique form of equipment function.

Power Alcohol

Like the proverbial bad penny, the matter of power alcohol turns up at regular intervals as if it were a bright new idea. Too often a discussion of power alcohol comes at a time when most people have forgotten the facts of the situation. For this reason we thought it timely to refer you to a booklet entitled "Power Alcohol" which was distributed less than a year ago by the Committee on Motor Fuels of the American Petroleum Institute. If you do not have a copy, we suggest that you get one. It covers quite comprehensively the history of power alcohol movement, contains references to tests and investigations. It is frankly a strong case against a consideration of alcohol as a motor fuel—with scientific reasons why.

Cemented Carbides

Vascoloy-Ramet, pioneer in tantalum steel cutting tools, has just issued an interesting catalog listing its grades of tantalum-carbide tools and blanks. It is in handbook style—provides sketches of various types of single point tools, lists standard and non-standard blanks. One section gives the calculated weights of blanks of various sizes—rectangular and prismoid in form. Ask us if you want a copy right away.

Reamer Standards

The first American standard for reamers has been issued by the ASA and is described in detail in *Industrial Standardization*, October, 1941. Production men will find it worth while getting acquainted with this latest project.

Plated Rings

The West Coast SAE T & M meeting provided informal news of the development of chromium plated piston rings for aircraft engines and for heavy duty truck engines. Several of the best known names in piston rings already are working on this. It is claimed that chromium-plated rings last longer, produce less cylinder bore wear.—J. G.

KEEP THOSE DIES PRODUCING

with **KERNS**

DRAWING COMPOUND



The First Requirements

—of good drawing compounds are met in KERNS Products which prolong die life, reduce scrap to a minimum and speed up production. KERNS drawing compounds uniformly show the following characteristics:

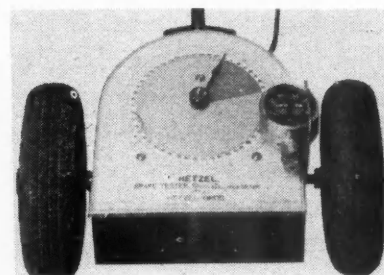
- 1 HIGH FILM STRENGTH
- 2 PROPER CO-EFFICIENT OF FRICTION
- 3 GOOD WETTING-OUT PROPERTIES
- 4 SOLUBILITY
- 5 CLEANS OFF EASILY
- 6 STABLE EMULSION

Kerns Guarantees to reduce your Drawing Compound costs . . . make us prove it.

Write or Phone for Test Samples . . . no obligation.

The L. R. KERNS CO., Inc.

Manufacturers of Industrial Lubricants
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This Hetzel Brake Tester, a new product of Hetzel Bros., Los Angeles, Cal., is a direct geared machine with speedometer and distance meter. It is clamped to the vehicle when testing the latter's brakes



HI-TEST  SAFETY
PLATE

THE GLASS THAT *gives you Better Vision*

● Good plate glass permits you to see things as they are. L·O·F Hi-Test Safety PLATE is that kind of glass—with ground and highly polished surfaces—a safety sandwich, with two lights bonded together by a strong, tough, transparent plastic.

L·O·F Hi-Test Safety PLATE reduces eyestrain... makes riding and

driving safer and more enjoyable. Motor cars equipped with L·O·F Safety Plate offer maximum protection, comfort and uninterrupted vision.

The familiar L·O·F trademark—"The Mark of Quality"—identifies this glass. Car salesmen use it as evidence of the finer materials in the car they sell.



LIBBEY · OWENS · FORD
HI-TEST *Safety Plate* GLASS

Parts Makers Pool Equipment

(Continued from page 19)

program, with Ford and General Motors joining Chrysler in production of these military vehicles, will offer the Metal Working Manufacturers Committee an opportunity to obtain large subcontracts from these automobile manufacturers for the fabrication of tank parts. Chrysler already lists 700 suppliers from 20 states as participating in the tank program. The committee also will bid on primary ordnance contracts, with one of the member companies mak-

ing the bid and the others serving as subcontractors according to their facilities under the pooling arrangement.

Need for further permeation of defense contracts down among the smaller companies is illustrated by the Soss Mfg. Co., where 200 employees signed a petition asking the Government for defense work. These 200 employees listed 700 dependents, so when multiplied by thousands of plants, the effects of priorities, unemployment can

be readily seen. Curtailment of brightwork on new passenger cars after Dec. 15 also threatens unemployment and financial difficulties among the metal plating plants that supply the automobile industry. With possible job losses facing 7000 employees in this industry, the Labor Division of OPM suggested a four-point program to relieve distress after a joint meeting of 19 management, union and Government representatives. This program calls for no new plating plants or facilities to be built while plants and facilities are available, pooling of facilities on an industry wide and geographical basis in order to obtain defense contracts or subcontracts, an industry-wide study to be made in cooperation with OPM to ascertain how the industry's facilities may be adapted to production specifications of the Army and Navy and investigation of the extent to which curtailment of brightwork in automobiles will affect the industry's employment, with the possibility of revising the order. With the objective of pooling the facilities of plating companies for defense bidding, committee for the electro-plating industry has been set up with an office and secretary in Toledo. R. J. Nagle, of James E. Nagle & Sons, Toledo, is the secretary, while other committee members are John N. Kelly, Kelly Plating Co., Cleveland; W. W. Hunlock, Gerrity-Adrian Corp., Adrian, Mich.; Leo T. Jensen, Chromium Corp. of America, Chicago; H. M. Karet, Keystone Chromium Corp., Buffalo; and C. S. Slack, Detroit plating industries. In Detroit alone more than 800 employees of plating companies face layoffs by Dec. 15 due to the brightwork curtailment order.

Hupp Leases Floor Space to U. S. Rubber, Chrysler

Stockholders and creditors of the Hupp Motor Car Corp., have approved a plan to lease 400,000 sq. ft. of the company's multiple story factory building in Detroit to the U. S. Rubber Co. on a three-year basis for \$420,000 and 215,500 sq. ft. to the Chrysler Corp. for \$150,850 on a two-year lease. The buildings have total floor area of 1,115,485 sq. ft., of which 187,000 sq. ft. is being used for manufacturing operations.

John E. Murphy, the trustee, will file his final report in Federal court at Detroit, Dec. 8, on amounts owed the company on creditors' claims, totaling \$346,701, of which some is in dispute. For the 10 months ending Sept. 30, the company earned a net profit of \$150,182 and cash on hand on that date was \$211,300. Two parcels of real estate were disposed of and the resulting \$204,593 was used to reduce the RFC mortgage, which totaled \$630,862 as of Sept. 30. The trustee is hopeful of dissolving the receivership by Jan. 1 and returning the business to the stockholders.

Felt

FELT . . .

*Improves
the Modern Car*

From the beginning felt has been to the auto manufacturer what axle grease must have been to the wagon builder. Felt makes a car run quietly! And it does this in many ways. As packing washers, felt retains the lubricant that oils many important bearings and joints. Felt pads eliminate squeaks and rattles under the hood, between fender and body, chassis and spring, radiator and frame and many other places.

Felt is the ideal material for these automotive uses because it is resilient and resists the attack of the elements, it does not fray or ravel, lends itself to compression, and it lasts a long time.

The engineering staff and laboratory facilities of the Western Felt Works are always at your disposal. Call on them when you want experience or information on both old and new uses of felt.

WESTERN FELT WORKS

4035-4117 Ogden Avenue

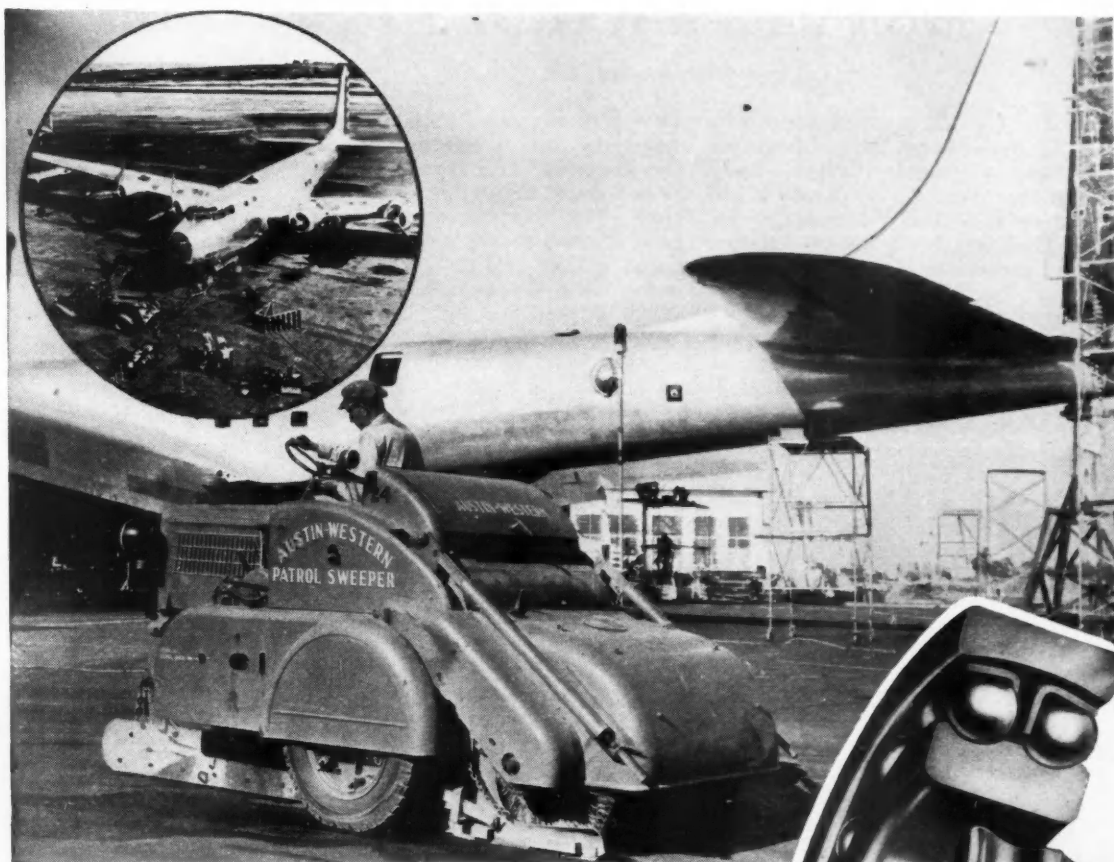
Chicago, Illinois

Largest Independent Manufacturers and Cutters of Wool, Hair and Jute Felts. Established 1899.

Also Molders of the Acadia Synthetic Rubber

BRANCH OFFICES IN ALL PRINCIPAL CITIES





The U.S. Army recently ordered 150 of these SKF-equipped sweepers, built by Austin-Western Road Machinery Company for use at its various flying fields. On the B-19, world's largest bomber, SKF Bearings are used on the cranks of four Wright Cyclone 18 Engines.

Cleaning Up



THE B-19'S HOME WITH SKF'S

Keeping the home of the SKF-equipped B-19 Bomber tidy so that powerful propellers will not suck up discarded bolts, small metal parts and stones is the job of this Austin-Western Airport Patrol Sweeper. Keeping the chief moving parts of this patrol sweeper functioning smoothly is the

job of SKF Bearings. That both are jobs well done is proved by the faithful performance of this patrol sweeper which has yet to lay off for bearing trouble. No matter how *small* . . . nor *BIG* . . . the job, chances are the bearings are SKF.

SKF INDUSTRIES, INC., PHILA., PA.

4870



BALL SKF BEARINGS

December 1, 1941

When writing to advertisers please mention Automotive Industries

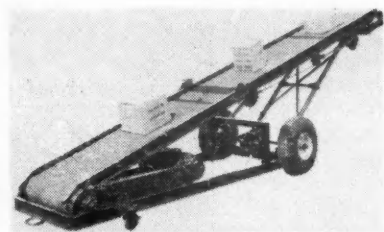
MEN and MACHINES

(Continued from page 49)

gages are manufactured in accordance with American Gage design standards. There are two standard types—Model A with four gaging buttons and Model C with solid block and two gaging anvils. They are made in 30 different sizes. Frames are Meehanite castings.

A REVERSIBLE portable belt piler with rubber tire wheels is being built by the Standard Conveyor Co., North St. Paul Minn., for piling and loading or

unloading box cars. It is easily moved from one site to another by hooking the lower end to a truck. The carrier is raised and lowered by a crank on the side. This particular machine has a safe maximum piling height of 8 ft., but it will pile up to 10 ft. The minimum piling height is 4 ft. It is also provided with a rough top belting in order to keep the commodities from slipping when set for the high elevation of 10 ft. piling height.



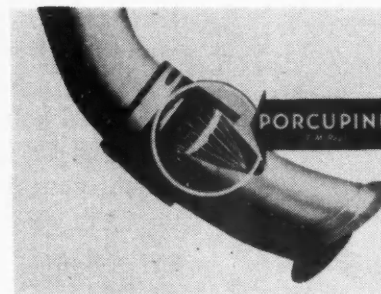
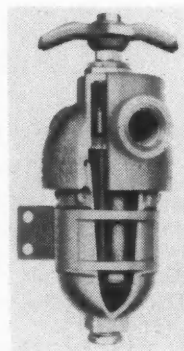
Standard Conveyor portable belt piler

Another product recently announced by this company is a wood roller conveyor especially designed for handling explosives in ammunition and armament plants.

Crane Water Pump Seal

A new water pump seal announced by Crane Packing Co., Chicago, consists of two parts, a synthetic rubber bellows and spring. The entire unit is spring driven and operates as a driving couple with the seal not touching the shaft. The bellows connects two flanged ends with the spring placed in a fixed position against the inside shoulders of the flanged ends and so holds the contact facings against the sealing washer on the one end and the driving base on the other. Because of the seal's ability to flex and compress as a unit, pressure variations, misalignment, fan thrust, torque or vibration set up by an unbalanced impeller, are automatically compensated for.

Purolator filters of this type, G-159-J3, which are reported to be installed in the hydraulic systems of 16 different makes of American warplanes, operate at 1000 to 1500 psi. Its bursting pressure is over 4170 psi.



The Porcupine, a new anti-siphoning device developed by the Scully Signal Co., Cambridge, Mass., automatically locks in position when installed in the filler neck of a fuel tank

Deep Dies...

Demand "Dag" Colloidal Graphite

"It eliminates sticking of forgings in deep impression dies. It imparts a smooth finish to the die surfaces and reduces wear from friction and heat and increases die life."

---Drop Forge Superintendent.

Write for the whole story and name of your local supplier. Ask for Bulletin No. 130T

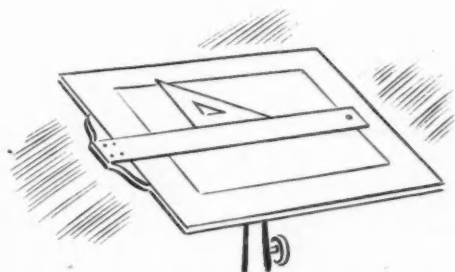
ACHESON COLLOIDS CORPORATION
PORT HURON, MICH.

"dag" is a registered trade-mark of Acheson Colloids Corporation.





A very convenient governor drive outlet for control of engine-speed from the accessory shaft when this shaft is on carburetor side of engine.



ON YOUR NEXT TRUCK ENGINE PLAN THE GOVERNOR INSTALLA- TION ON YOUR DRAWING BOARD

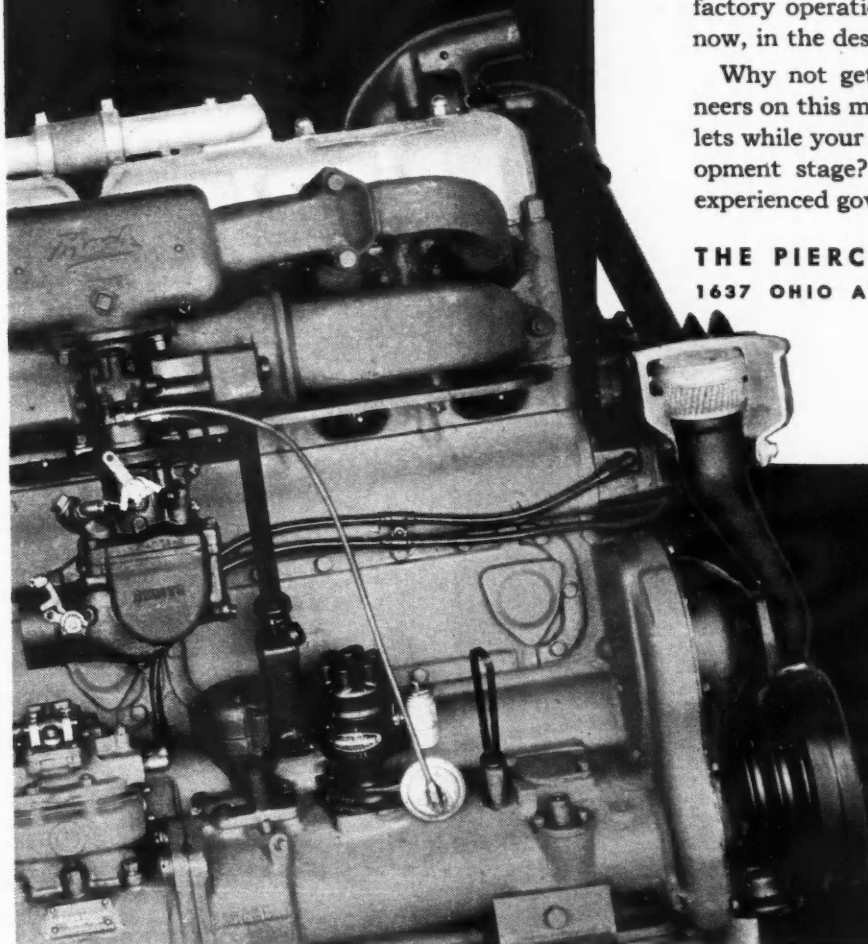
● When the engine is being designed it's easy to provide an ideal drive and mounting for the governor.

After the engine's in the chassis it's too late for an ideal installation. Truck operators today are demanding engine protection and often it is necessary to resort to flexible drive shafts from one side of the engine to the other, when a short, direct solid drive could have been used if the engine had a conveniently located mounting pad and outlet for the governor installation.

The engine you design for truck work today may go into a great variety of tomorrow's equipment, much of which *must* be governed for satisfactory operation. Provide that governor outlet now, in the design.

Why not get the suggestions of Pierce engineers on this matter of convenient governor outlets while your new engines are still in the development stage? At your request we'll send an experienced governor engineer to work with you.

THE PIERCE GOVERNOR COMPANY
1637 OHIO AVENUE • ANDERSON, INDIANA



*Pierce
Governors*

STANDARD SINCE 1913

Continental Completely Renovizes Plant for Military Engine Production

(Continued from page 31)

weights are slotted on a horizontal type Colonial broaching machine, using two fixtures and four broaches. This produces the wide, formed slot which is held to fine limits all over.

On the crankcase main section, the holes in the cylinder pads are tapped in a multiple-spindle Baush tapper, fitted with Scully-Jones drill chucks. Tappet holes are finish-bored in a special nine-station Ex-Cell-O precision

boring machine. Three stepped bores are handled in this operation—1.288 in. diameter held to plus 0.005 in., minus 0.000 in., 1.0595 in. diameter held to plus or minus 0.005 in.; and 0.9130 in. held to plus or minus 0.0005 in.

Another Ex-Cell-O boring machine is used on this part for the facing and boring of cylinder pads and bores. In this operation, the faces are held to 9.000 in. plus or minus 0.005 in. from

the center, while the bore is held to 5.196 in. plus or minus 0.005 in.

A special multiple-spindle Ex-Cell-O drilling machine is found on the crankcase main section line—for drilling, taper reaming, and countersinking 54 cylinder pad holes; drilling, taper reaming, and counterboring 18 cylinder pad holes.

On the pistons, the Heald Bore-Matic is used for semi-finish boring, finish counterboring, and forming the grooves in the piston pin holes, using cemented-carbide tools. In a subsequent operation a Heald precision boring machine is used for finish-boring the piston pin hole, holding the bore to 1.2485-1.2475 in. In addition, the location of the bore is held to 2.092-2.088 with respect to the piston head. Finishing is done with a diamond tool.

Easily one of the finest pieces of technical equipment found in the manufacturing department is the Gisholt Dynetric balancing machine which is used for the final checking of dynamic balance of the complete crankshaft and counterweight assembly. The balance of the assembly is held within 1½ oz.-in.

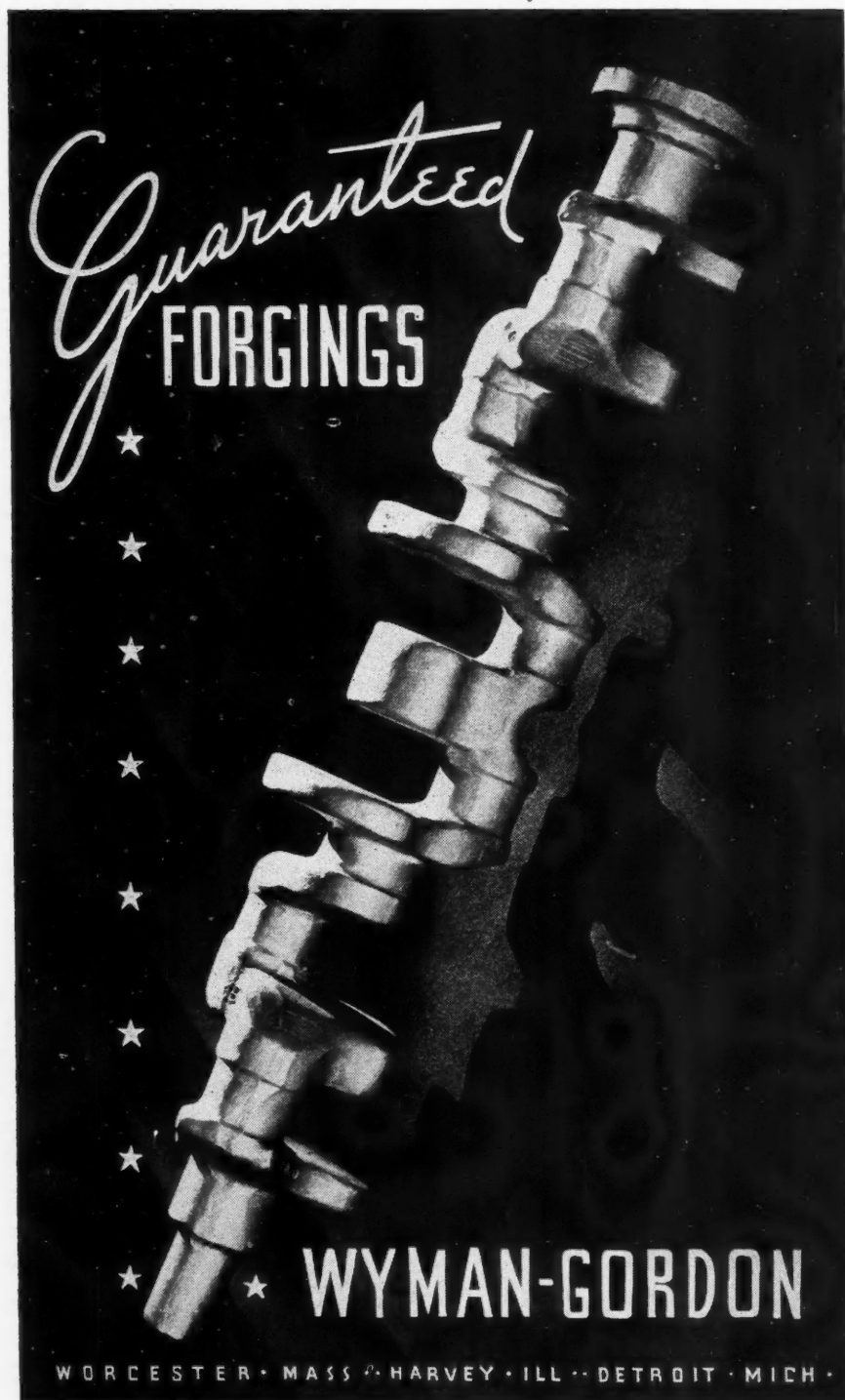
One large bay is devoted to the production of special attachments required for tank engines, including—the big blower fan, flywheel, and hub. This department is completely tooled up for the fabrication of these parts and for making up the final assemblies. A battery of Fellows gear shapers is used for cutting the flywheel gear teeth. The final assembly is balanced on a dynamic balancer of the GMR type.

Tracing the course of the component parts as they clear through the various manufacturing departments, we find that after final inspection and approval by Army inspectors, the parts find their way to the "bond" room where they are held under lock and key until requisitioned for use in the assembly department.

Quality control is one of the basic steps in the process of every operation. Magnaflux equipment, which has become so widely used in the inspection of finely finished stressed parts, is found in many departments throughout the plant; also is found in the final assembly department for checking parts after tear-down.

Among the features of the final assembly department are the special final assembly stands, so designed as to facilitate the integration of the complete engine; also the familiar Detroit Rex washing machine which is used for cleaning the parts after tear-down.

The testing facilities consist of a bank of eight test cells for run-in, and a bank of six test cells for final schedule runs. The test cells so effectively silence the operation of the engines that several 400 hp. units may be operated simultaneously without apparent disturbances of the sound level in the community. The arrangement of the test cells as well as the design of the control panels and instruments has been formulated on an advanced pat-

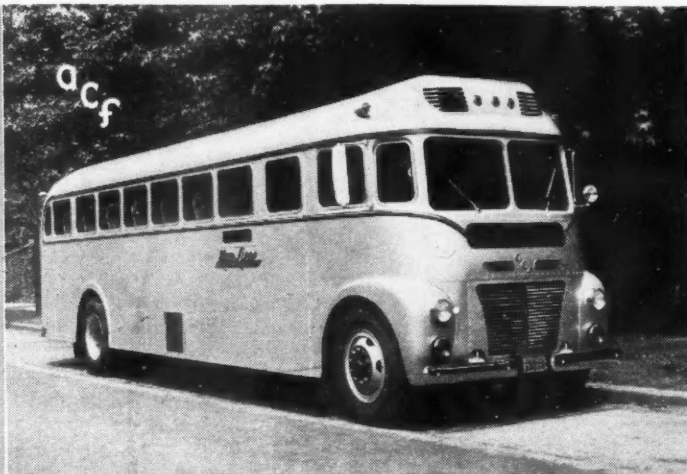


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a. c. f.
BUS

DIAMOND T
MOTOR TRUCK



BROCKWAY
MOTOR
TRUCK

A Definite Increase in the manufacturers who list **TRU-STOP Emergency BRAKES** as standard or optional...

● Right now the manufacturers who are installing TRU-STOP *Emergency* BRAKES have something *extra* to sell. Factory branches and Dealers are using it to great advantage. It's the *extra* protection of the world's safest emergency brake against accident to equipment that, more than likely, will be hard to replace.

★ ★ ★

That is a thought that is worthwhile. Of course, it is not as important as the fact that with TRU-STOP *Emergency* BRAKES your trucks and buses can be stopped smoothly and safely from any vehicle speed—or that the ventilated discs make it possible for operators to use TRU-STOPS continuously on long grades to supplement and save service brakes—or that their action is just as sure when linings are paper thin—or that TRU-STOPS cut brake maintenance to the bone.

All those points make it worthwhile to use TRU-STOP *Emergency* BRAKES on your products.

AUTOMOTIVE AND AIRCRAFT DIVISION

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TRU-STOP *Emergency* BRAKES

THE TRU-STOP
"VENTILATED" DISC
MAKES TRU-STOP
EMERGENCY BRAKES
SERVE BETTER AND
LAST LONGER



In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

tern, taking advantage of the known developments in this field.

Metallurgical facilities vie with the best to be found in the industry. To begin with, there is an excellent metallurgical laboratory for research and production controls. One of the finest pieces of equipment here is a comprehensive X-ray laboratory provided with a 200 KVA X-ray machine complete with all of the essential accessories.

The production heat treating department is generously equipped with some of the finest heat treating devices known to the art. As examples of this, we note the following—Homo furnaces,

Homo-Carb furnaces, Homo Nitriding furnaces, Upton electric salt bath furnaces, Vapocarb furnaces, and a Pangborn sand blasting machine with rotary table.

Polishing, filing, burring, etc., are familiar operations in aircraft engine practice—and such operations abound in profusion here. It is of interest to find that each machine used for this purpose is fitted with the Roto-Clone (American Air Filter Co.) air cleaning attachment to protect the operators from the consequent dust and dirt; also to prevent dirt and abrasive particles from contaminating the atmosphere of the machine shops.

Creeper Track for Single Wheels

(Continued from page 47)

Beyond the fact that it requires no external anchorage in the form of an idler wheel at the end remote from the driving wheel and no intermediate wheels, and is thus truly self-contained, there is an important difference between the Rotaped and the conventional creeper track. That is to say, while the latter is subjected to tension arising from driving forces over a part of its length and tension due to weight-supporting throughout the whole of its length, the Rotaped has to withstand loads only in the section or sections in actual contact with the ground and the links are not subjected to stresses arising from tension.

Another point of note is that when each link swings down to the ground, in front of the wheel, its movement is so controlled that its angular velocity about the pivot pin at its leading end diminishes during the operation from maximum to zero; as a result, when it makes contact with the ground there is no impact and the link assumes its horizontal position gently and noiselessly.

Further, while any two links are on the ground they are supported at their common joint by one of the chains and form a bridge for the wheel as it passes from one link to the next.

As shown in the illustrations, each section of the creeper track has three slightly proud faces on its outer surface to assist traction. But if and when this smooth surface fails to grip by reason of gradient or nature of the ground, or both, "spuds" can be fitted, one to each section, secured to the inner side of the track; each spud is located at right angles to the link by four dowel pins and a single screw, and has six optional positions to provide adjustment of the extent of its projection from the track.

In the case of six-wheeled trucks (two rear driving axles) the track is formed of eight sections, instead of six, to enable it to encircle the two wheels in-line-ahead.

It is stated that among demonstrations of the efficiency of the Rotaped creeper track it was used on a Fordson tractor with a four-furrow plow and enabled a good performance to be obtained under conditions that prevented a wheeled tractor from moving the plow at all with either steel or pneumatic-tired wheels.

Ainsworth Promoted

H. M. Ainsworth, formerly tank production expert of the British Purchasing Committee in the U. S. A., has been appointed Director of Tank Design at the Ministry of Supply. Ainsworth was in Paris making guns and tanks for the French Government. He escaped as the Germans entered Paris.

"The situation is well in hand!"

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